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A Glance at the Contents—

British Industries Fair.

A plan of the stands with the names and positions of exhibitors in the Gas Industries Section of the B.I.F. at Castle Bromwich is published. [p. 249.]

Protection of Gas Services from Corrosion.

In a paper before the Western Junior Gas Association, Mr. K. L. Clark, Chief Chemist to the Weston-super-Mare Gaslight Company, deals with gas services and their protection from corrosion. [p. 256.]

Board of Trade Inquiry at Bristol.

An inquiry was held into an application by the Bristol Gas Company for powers to erect in the Siston district of Warmley a new gasholder, or, alternatively, to carry out extensions to an existing holder. [p. 254.]

New Showrooms at Bath.

Very fine new showrooms, offices, and distribution department have been erected by the Bath Gas Company and were formally opened by Dr. E. L. Burgin, Parliamentary Secretary to the Board of Trade. [p. 250.]

Manufacture of Household Coke in Coke Ovens.

The discussion is published on the paper read by Mr. H. O. H. Cerckel before the Midland Section of the Coke Oven Managers' Association in which he dealt with the manufacture of household coke in coke ovens. [p. 253.]

Gas-Works Bye-Products in Australia.

Speaking before the Seventh Convention of the Australian Gas Institute, held at Melbourne, Mr. R. S. Andrews, B.Sc., reviewed the position of gas-works bye-products in Australia. [p. 259.]

Retirement of Sir Henry Birchenough.

The retirement of Sir Henry Birchenough, Bt., K.C.M.G., from the Chairmanship of the Imperial Continental Gas Association was marked on Tuesday, Jan. 23, by a dinner given by him at Claridge's Hotel. [p. 248.]

Gas Exhibition at Oxford.

An exhibition organized by the Oxford and District Gas Company was opened last Thursday by Sir Francis Goodenough at a luncheon at which the guests included prominent representatives of the City and the University. [p. 246.]

Sulphuretted Hydrogen Test Papers.

A reader having inquired the reasons for the Gas Referees substituting dry for moist lead acetate test papers in official testings of purity from Jan. 1, we referred the inquiry to them, and they have furnished a note on the alterations in procedure from the inception of official testing for H_2S to the present time. [p. 253.]

Forthcoming Engagements

Feb. 5.—MIDLAND ASSOCIATION.—Annual Dinner and Dance, Grand Hotel, Birmingham. Reception, 6 p.m.; Dinner, 6.30 p.m.

Feb. 5.—INSTITUTION OF CHEMICAL ENGINEERS.—Meeting of Chemical Engineering Group. Paper by Messrs. H. Hollings and S. Hay on "Recovery of Benzole by Activated Carbon."

Feb. 10.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Visit to Chester. Paper by Mr. H. G. Davison.

Feb. 10.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Meeting. Paper by Mr. A. Bujnowski.

Feb. 12.—I.G.E.—Meetings of Finance Sub-Committee, 1.45 p.m.; Membership Sub-Committee, 2.30 p.m.; General Purposes Committee, 3.15 p.m.

Feb. 13.—I.G.E.—Meetings of Council, 10 a.m.; Gas Education Executive Committee, 4 p.m.

Feb. 15.—S.B.G.I.—Meeting of Council, 2.30 p.m.

Feb. 16.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. P. Lloyd.

Feb. 17.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Shipley. Paper by Mr. L. R. Cowley.

Feb. 17.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Visit to Portobello Power Station. Paper by Mr. W. Masterton.

Feb. 21.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

Feb. 22.—B.I.F.—Visit of Joint Junior Gas Associations.

Feb. 23.—B.I.F.—Gas Salesmen's Day.

Feb. 24.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bristol. Paper by Mr. C. H. Chester.

Feb. 27-March 1.—B.I.F.—Joint Gas Conference.

March 8.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. H. J. Reynolds.

March 10.—WESTERN JUNIOR ASSOCIATION.—Meeting at Plymouth. Paper by Mr. A. R. Langford.

March 10.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Annual Business Meeting. Paper by Mr. H. S. Milne.

March 14.—I.G.E.—Meeting of Meters Committee, 2.30 p.m.

March 14.—YORKSHIRE JUNIOR ASSOCIATION.—Joint Meeting at Warrington with Manchester and District Juniors. Paper by Dr. Winter.

March 16.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. L. T. Minchin.

March 24.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Batley.

April 6.—NORTH BRITISH ASSOCIATION.—Spring Meeting at Perth.

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Page 38. LEA BRIDGE. N. H. Davies appointed S., vice H. Hand retired.

EDITORIAL NOTES

The Industry in Australia

IT is apparent from the communications presented at the seventh convention of the Australian Gas Institute that the Industry's trend there is towards complete gasification. In his Presidential Address ("JOURNAL" for Jan. 10) Mr. C. F. Broadhead expressed the belief that the future will see the wholesale adoption of complete gasification plants in Australia. Mr. R. S. Andrews, publication of whose paper we conclude to-day, urges the gasification of coke—that gas-works plant should invariably include water gas plant, whether the works be large or small. Both authors occupy positions of responsibility in the Australian Gas Industry, and their undertaking, the Metropolitan Gas Company of Melbourne, like the Australian Gaslight Company, has lately installed large-capacity water gas plant. In Australia, says Mr. Andrews, the cost of water gas per therm is only three-quarters that of coal gas; and the position of the coke market in Victoria and Sydney would have been "deplorable" had it not been for the action of the two undertakings in deciding to take off the market a large quantity of coke. This policy is dictated by conditions which differ from those in Great Britain, and the younger Australian coals, excellent for gas making, have not good coking properties, the coke being friable and producing a large percentage of breeze.

Another feature is apparent from the convention sessions, and that is the increasing amount of research work which is being so skilfully undertaken and so successfully applied. This relates to all phases of gas-works practice; and some aspects of this research work are touched upon by Mr. Andrews. Highly interesting, for instance, is his reference to the use of ammonium polysulphide as an insecticide. A process has been developed using concentrated ammonia liquor and sulphur from spent oxide, and the product can be made for less than a quarter of the present market price—a fact which opens up a fresh possibility for profitable ammonia recovery. Readers will remember the paper contributed by Mr. Broadhead at the annual meeting of the Institution of Gas Engineers at Leeds in 1930. In that paper, which aroused much discussion, the author gave an account of the production by his Company of Bitural for road making. The reason for making this product was that continuous vertical retort tar proved unacceptable for the purpose in Australia, and that compliance with a specification such as those laid down in Great Britain would not satisfy the buyer. At first Bitural was made by the polymerization of unsaturated hydrocarbons in the tar by air blowing, and formaldehyde condensation of the tar acids. Mr. Andrews explains that the cost of the formaldehyde proved a disadvantage, and also the resultant product showed signs of oxidation. The procedure has been modified. An aldehyde is produced *in situ* by the decomposition of vulcanized triglycerides. A portion of this vulcanized material is decomposed, and the remainder serves to inhibit oxidation and soften the pitch. The author's comparison of the properties of distilled tar, early Bitural, present-day Bitural, and bitumen is well worth studying, as also are his observations on a road-making material, Duratenax—a mixture of tar, pitch, and bitumen—produced by the Australian Gaslight Company.

In spite of the fact that they have been of the utmost value in Great Britain, Mr. Andrews maintains that tar specifications involving only such physical properties as specific gravity, distillation range, melting point, penetration, viscosity, &c., are absolutely valueless as a gauge of the quality of the road material; and he puts forward two tests to distinguish between a good road tar and a bad road tar. The first is an accelerated weathering test, the second an ultra-microscopic of the number and state of the carbon particles per unit volume. The more carbon particles per unit volume, the better suited is the tar for road making purposes. He maintains, too, that, as far as Australia is concerned, the most profitable way of utilizing vertical retort tar is as a gas enricher, in which connection the Metropolitan Gas Company has carried out valuable experimental work on cracking both in retorts and in water gas generators; and some of the results of these experiments are to be found in Mr. Andrews' paper.

Standardizing Home Colours

WITH the object of remedying what they have felt to be an undesirable state of affairs, the Household Appliances Section of the London Chamber of Commerce have decided after careful consideration to recommend to manufacturers embraced in that Section proposals for the standardization of a limited number of colours. In furtherance of so meritorious an object as that of making our homes brighter through the introduction of more colour every effort should be made, and standardization of colours should be a help—even though there were some variation consequent upon different processes involved. It is a fact that during the past few years attention has been focussed upon the introduction of colour in the household appliances trade, and for various reasons the kitchen has been very largely improved in this respect. Gas apparatus manufacturers are manfully playing their part, with the result that appliances are both a joy to look upon, as well as a joy to use. But the possibility of even more than mere colouring of appliances is now envisaged; and if matching or contrasting is to be attempted, the value of standardization of colours, if it can be closely worked to, becomes apparent. An example quoted by the Chamber of Commerce is that the sky-blue of one manufacturer differs from the sky-blue of another—"much to the confusion of all concerned."

In these circumstances, it seemed to the Household Appliances Section that it would be well if a standard colour card were made available, showing the twelve principal colours used in the household appliances trade. So that this selection might be made by an independent authority, the Section invited the British Colour Council to choose twelve colours from their range of standard colours specially suited to the purpose in view. The British Colour Council will be publishing in the near future their comprehensive standard range of colours for all industries. The leading industries of the country using colour have been consulted, and the card will consist of a collection of 220 colours, featured in pure silk, together with numbers, names, and code words, with which a dictionary will be issued giving information concerning the colours and the names—foreign, historical, and legendary—by which they have been known. The colours to be considered as standard in the household appliances trade have been selected from this larger range, and will be referenced and named. It is recognized by the Section that such a scheme as this can only succeed with the close co-operation and whole-hearted support of manufacturers, but this will doubtless be forthcoming so far as may prove practicable. It is understood that the adoption of these standard colours by manufacturers will not preclude them from supplying articles in other colours.

Speaking at a luncheon a few days ago, Mr. Holbrook Jackson, Chairman of the British Colour Council, pointed out that colour and cheerfulness are very closely related,

and that consequently any movement towards the further brightening of our homes represents very good work which should be supported. As this must apply with great force to kitchens and sculleries, wherein the housewife is usually compelled to spend much of her time, it was gratifying to note the expression of pleasure by Mr. G. E. W. Crowe, the Chairman of the Household Appliances Section, who presided at the luncheon, when referring to the manner in which the Gas Industry has supported the movement. This support Mr. H. M. Thornton assured him would be continued.

Is It Peace?

THERE is a " certain liveliness " on the electricity front, which may not be ignored, and we make no apology for reproducing for the benefit of our readers, with acknowledgment to the *World's Press News*, a statement appearing in the latest issue of that paper, under the heading " New Electricity ' Drive ' in February—Bigger Appropriation for Five-Months' Campaign." This is what the writer has to say upon the subject:

" Within a few days electric cooking and water heating will be launched on the biggest boost they have yet had, states *Electrical Trading*. These two subjects have been chosen by the Electrical Development Association for their first publicity campaign in 1934. Compared with ' The Wizard in the Wall,' who had a brief innings at the end of last year, the new campaign is extensive and costly. It will be carried on for five months, and will be given a much larger financial backing.

" The new campaign will deal with two specific subjects, whereas ' The Wizard in the Wall ' was intended to be of a general character, forming the foundation upon which the Association will continue to build a well-informed and favourable public opinion. Advertising for the national Press is being prepared, and the first announcements to the public will be made early in February.

" On this occasion the E.D.A. intends to give the industry full information in advance, so that tie-ups can be arranged and the fullest benefit be derived from the general public appeal. A programme of the campaign is being prepared and will be circulated to the members of the Association during the coming fortnight. Supplementary services will be explained, and the trade will be given the opportunity to prepare special window displays, local advertising, and direct mail propaganda.

" As a secondary feature, the Association intends to make an appeal through the trade, industrial, and professional Press. This advertising will be designed to appeal specially to each individual occupation, and will boost lighting, heating, and power in particular."

This is a programme which must be countered in no half-hearted manner by the Gas Industry.

Pipe Corrosion

THE increasing attention which is being paid to the subject of pipe corrosion is fully justified, and in this connection the contribution by Mr. K. L. Clark, Chief Chemist to the Weston-super-Mare Gaslight Company, indicates the excellent experimental work which has been undertaken in the Company's laboratory on the effectiveness of various types of external protective media for pipes, and of internal coverings of oil or paint. It would appear from the experiments that, as far as internal painting or oiling is concerned, where dried gas is distributed and the paints are allowed to dry before the pipes are laid, there will be an added security against trouble from internal corrosion. On the other hand, with moist gas, the covering will be softened sufficiently to admit of paint fluid in solution being carried forward by the gas, thus leaving the pipe exposed to corrosion. That the drying of gas has an important influence in lessening internal corrosion is well known. The Weston Company was the second in the British Isles to supply dried gas to its consumers; and because of this steel tubing, suitably wrapped, has been exclusively used for services—and, we gather, with every satisfaction. " Taking into consideration the initial cost of these two materials and the widely varying corrosion and protective factors," remarks the author, " no hard and fast conclusion seems possible on this point of steel or wrought iron." Useful reference is made to the potentialities of copper tubing and of asbestos-resin pipes, though we miss mention of the properties of copper-bearing steel alloy and of corrosion inhibitors such as tetralin. The tests carried out at Weston on various external coatings are full of interest, and special notice will be taken of the satisfactory results obtained from asbestos-bitumen wrapping. Mr. Clark also speaks highly of the plastic bandage, which is made up of a closely woven material impregnated with petroleum jelly, for the protection of joints by a " cold " method.

New Ideas

AT a meeting of the Institution of Mechanical Engineers recently there was a remarkably interesting symposium of papers on invention, and one of these, by Dr. H. S. Hatfield, appeals to us very much indeed. He argues that anyone who makes a first-class scientific discovery is pretty sure to obtain, without the exercise of smart business capacity, a post which will at least keep him modestly and enable him to go on working. Such possibility, however, can hardly be arranged for technical invention. " If," he says, " we could take every person in this country who has proved himself to possess inventive ability, and give him a livelihood and all necessary means for further work, it is doubtful whether the result would repay the cost, even in the long run. On the other hand, to put such a man in a technical laboratory and tell him what to do, at the same time taking from him without reward all his work, no matter how valuable it may be, is to make a hack of him. . . . Probably the most successful means of fostering invention is for a firm to subsidize an individual who comes forward with promising ideas and appears to possess the personal qualities which make for success. But it is essential that the worker should be rewarded by a fair share in the financial results of success, and not be made a salaried official."

Dr. Hatfield points to the fact that the standard of education needed to-day for successful invention is a very high one; and he goes on to say that it will always be difficult for a person with strongly marked tastes for a particular type of work to bring his mind to acquiring knowledge not bearing directly upon the subject. " But anyone not possessing a thorough grounding in chemistry, physics, and mathematics, will be at a hopeless disadvantage in almost any field of technical invention to-day. Such a grounding can only be acquired by university training in youth; and while the less gifted students may well devote their time at college to acquiring the actual practice of engineering, the gifted student, if given a training in pure science, will readily acquire the further knowledge incidental to a particular branch of technical work, for much of this knowledge is grasped at once as the simple application of fundamental physical and chemical principles, while the rest is a collection of practical facts derived from experience."

And this from the final paragraph of Dr. Hatfield's paper: " The idea that an inventor, or any other creative worker, will do better work if given a comfortable salary rather than the hope of fortune in case of success, is entirely fallacious. Creative work is very rarely accomplished by the steady round of daily office hours most favourable to normal routine work. In every branch of endeavour, most of it has been accomplished in violent bursts of overwork at high pressure, which necessarily alternate, except in the case of abnormally robust persons, with periods of comparative idleness, in which the unconscious mind is able to order its content. It is not that problems are solved more slowly by easier going, they are not solved at all when the attack is below a certain intensity."

PERSONAL

STAFF CHANGES AT LEA BRIDGE.

Mr. HENRY HAND has retired from the position of Secretary to the Lea Bridge District Gas Company owing to ill health. He has served the Company for 43 years and has been Secretary for the last ten years. He was presented with a handsome silver salver by the Directors on his retirement.

Mr. NORMAN H. DAVIES, A.C.A., who has been Accountant to the Company for the last four years, has been appointed Secretary and Accountant.

Early in December Mr. JOHN GRAYSTON joined the Company as Chief Assistant Engineer, taking the place of Mr. W. T. Kenshole, who is now Engineer and General Manager of the Merthyr Tydfil Gas Company. Mr. Grayston has previously served as Assistant with the Colne and Hinckley Gas Departments, and prior to his appointment to Lea Bridge he was Deputy Engineer and Manager to the City of Plymouth Gas Department. He obtained the Silver and Bronze Medals in the City and Guilds of London Examinations and 1st Class Diploma with distinction from the Institution of Gas Engineers.

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NEW B.C.G.A. MANAGER.

MR. WILLIAM D. ROWE,
who, as announced in the "JOURNAL" last week, has been appointed Manager of the British Commercial Gas Association.

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On relinquishing his appointment as Engineer and Manager of Abertillery Gas-Works Mr. I. G. JENKINS was presented with a silver cigarette case by the staff and employees. Mrs. Jenkins was the recipient of a beautiful silver teapot, suitably inscribed. Mr. Jenkins entertained the whole of the staff and employees at a farewell supper at the Bush Hotel, when many tributes were paid to the excellent service which he had rendered to the Gas Department during the past 22 years. Responding, Mr. Jenkins acknowledged the gifts, and expressed appreciation of the "team spirit" which had always existed between the men and management. He expressed the hope that the same goodwill and co-operation would be shown to his successor, Mr. Maycock.

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Sir THOMAS ROYDEN, Bt., C.H., has been elected Chairman of the Imperial Continental Gas Association vice Sir HENRY BIRCHENOUGH, Bt., K.C.M.G., who becomes Deputy-Chairman.

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Included in the list of elections to membership of the Institution of Civil Engineers we note the name of Mr. F. B. RICHARDS, who is Chairman of the Woodall-Duckham Companies.

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The completion of 50 years' faithful service was recognized when Mr. ALEXANDER WOOD, senior foreman sheet-metal worker to Messrs. Alder & Mackay, Ltd., Gas Meter Manufacturers, Edinburgh, retired on pension recently. Mr. Wood entered the Company's service on Jan. 17, 1884, when their Works were located in Sciennes, and he was appointed a foreman shortly after the opening of New Grange Works, Stewart Terrace, in 1891. In presenting Mr. Wood with a clock to mark the occasion, his employers recorded their deep appreciation of Mr. Wood's loyalty and interest during his long service.

OBITUARY

CHARLES FRANCIS TETLEY, M.A., LL.D.

By the death of Mr. Charles Francis Tetley on Jan. 25 the University of Leeds lost one of its most generous benefactors, and a highly valued member of its Court and Council. His interest in the affairs of the Gas Industry was of long standing, and when it was decided to establish the Livesey Professorship in the University, after the death of Sir George Livesey in 1910, and to create an Advisory Committee for the Department of Coal Gas and Fuel Industries, Mr. Tetley became the first Chairman of the Committee, an office which he held without a break up to the time of his death. He brought to bear upon this branch of his many activities not only a ripe judgment, with unfailing courtesy and tact, but knowledge derived from active participation in the work of the Leeds Corporation Gas Department on the one hand, and of the Council of the University on the other. His distinguished services to the University in this and other ways were recognized in 1922 by the addition of his name to the list of Honorary Graduates of the University as Doctor of Laws. His gifts to the University have been many, the latest being that of the recently opened Sports Pavilion on the University Athletic Grounds.

Col. Charles Harold Tetley, D.S.O., LL.D., his eldest son, preserves the family tradition of interest in educational, religious, and charitable institutions, and is at the present time Pro-Chancellor of the University of Leeds.

BOOK REVIEWS

Electrical Year Book, 1934.*

In this edition of a popular handbook for electrical engineers and all users of electrical machinery and plant, a complete rearrangement of the contents has been effected which will greatly facilitate reference. Almost every aspect which interests the industrial user of electricity is treated in detail, and the whole of the subject matter has been thoroughly revised and brought up-to-date.

The greatest contrasts exist in electrical work at the present time. On the one hand is the heavy plant of the super-power stations and the grid, and on the other hand delicate apparatus for testing. The method of sectionalizing adopted in the arrangement of the book has enabled such diverse subjects to be treated comprehensively.

* Published by Emmott & Co., Ltd., 31, King Street West, Manchester; price 1s. 6d. net.

Physics in the Building Industry.*

This is the 20th Lecture of the "Physics in Industry" Series, and it concerns the scientific worker in a traditional industry. The author is Dr. R. E. Stradling, M.C., Director of Building Research, Department of Scientific and Industrial Research. Concerning plastering, he asks: "Are the ceilings in your home or the internal surfaces of your walls cracked? Do they grow the so-called 'whiskers' (a whitish fluffy efflorescence of alkali sulphates)? Do they 'pop' at you in a series of small explosions? It is improbable that any of you who live in modern houses can answer all those questions in the negative. Of all the troubles brought to the Building Research Station for assistance the ones on plastering of one kind and another generally outnumber the rest. Very rarely indeed at the present day is sufficient time allowed to enable real traditional plastering processes to be adequately carried out, and particularly is this the case with the drying out period necessary for plaster work. To attempt to overcome these difficulties various 'new' types of plasters have been introduced—the major group being the calcium sulphate ones. These, though excellent in many ways, entail a further interference with traditional craftsmanship. The present state of this section of the building industry is one of great confusion caused not only by the technical difficulties but by the multitude of conflicting trade interests which must arise when a purchasing section of industry cannot specify what it wants nor criticize rationally what it buys except by trial and error on a job entailing a time lag often sufficiently long to allow the vendor to exonerate himself!"

* By Dr. R. E. Stradling, M.C., M.Inst.C.E., Director of Building Research Department of Scientific and Industrial Research. Published by the Institute of Physics; price 1s. 1d., post free.

THE NEWS OF THE WEEK

Benzole Recovery Plant for Dundee.—The Dundee Gas Committee have been authorized to install a plant for the recovery of crude benzole at the Dundee Gas-Works. It is expected that the annual production of benzole will be about 214,173 gallons.

The Laying of a New Gas Main between Granton and Davidson's Mains, at a cost of £14,000, was approved at a meeting of the Public Utilities Committee of the Edinburgh Town Council on Friday. It will be a 15-in. steel main supplied with gas at high pressure.

South Metropolitan Gas Company.—Subject to audit, the Directors of the Company will recommend at the forthcoming annual general meeting a final dividend of 3½% on the ordinary stock of the Company, making, with the interim dividend of 2½% paid in September last, 6% for the year ended Dec. 31, 1933.

Their First Branch Showroom has been opened by the Stockport Corporation Gas Department at 34, Bramhall Lane South, Bramhall, where they have on view a full range of all gas appliances, including a gas-fitted kitchen. Consumers will be able to pay their accounts at this branch, and so save journeys to Stockport.

Messrs. John Terry's, of Regent Street, have received a telegram from their Principals, the Metropolitan Gas Company of Melbourne, Australia, informing them that the net profits for the six months to Dec. 31, 1933, were £113,363; a dividend of 6s. 6d. per share has been declared; an amount of £25,000 has been transferred to reserve account; and a sum of £65,806 has been carried forward.

A Series of Calendar Blotters—one for each month of the year—is being sent out monthly by the Newcastle-upon-Tyne and Gateshead Gas Company to doctors, architects, builders, dentists, &c. On each of these is a pleasing little "snapshot" of a gas installation, the subject of which is changed each month. The first three deal with heating installations, while the spring and summer months will devote attention to the kitchen, bathroom, larder, &c.

An Exhibition of Large-Scale Cooking Apparatus has been held by the Scarborough Gas Company. During the exhibition an evening was devoted to a special tuitional gathering for local students of the hotel and boarding house management classes arranged jointly by education authorities and the Hotel and Boarding Houses Association. Miss Sanderson, Senior Lecturess for Radiation Ltd., was the instructress, assisted by Miss R. Abbey, the Scarborough Gas Company's lady demonstrator. The uses and special features of all the apparatus displayed were explained by Mr. S. Walker, Manager of the special apparatus department of Radiation Ltd.

In View of Increased Revenue from gas sales and greatly decreased manufacturing costs, gas prices at Port Talbot are to be reduced immediately. The reductions mean that the consumers will benefit to the extent of approximately £4450 per annum. The price of gas for ordinary meter consumers will be reduced from 4s. 2d. to 3s. 9d. per 1000 c.ft.; slot meter consumers from 4s. 11d. to 4s. 6d.; public lighting from 3s. 6½d. to 2s. 7d.; and fish fryers from 3s. 6d. to 3s. 1d. In addition, to all consumers where the average consumption exceeds 20,000 c.ft. per quarter, the first 20,000 c.ft. will be charged at 3s. 6d. and all gas consumed over and above 20,000 c.ft. per quarter will be charged at 3s. 1d. per 1000 c.ft. Special reduced tariffs are introduced for all consumers where the consumption exceeds 100,000 c.ft. per quarter. The Gas Manager is to report in three months on the question of further reductions in the price of gas.

Smokeless Fuel for L.C.C. Schools.

We learn that a smokeless fuel contract has been placed by the L.C.C. Education Committee for the heating of seven schools within its jurisdiction.

"It is a challenge to London fog to quit, and from the right quarter," said Lieut.-Col. W. A. Bristow, Chairman of Low Temperature Carbonisation, Ltd., who are producing the fuel from Yorkshire coal.

Gas Light and Coke Company's Dividends.

The Accounts of the Gas Light and Coke Company for the past year show that the balance to the credit of the net revenue account will enable the Directors to recommend the payment of dividends for the half-year to Dec. 31 last as follows:

	£	s.	d.	
On the 4% consolidated preference stock at the rate of	4	0	0	% per annum
On the 3¼% maximum stock at the rate of.	3	10	0	,, ,,
On the ordinary stock at the rate of. . .	5	12	0	,, ,,

carrying forward to the next account the sum of £186,128 10s. 5d.

British Industries Fair.

Previous Record Beaten by Two Acres.

More good news comes from the Department of Overseas Trade in connection with the 1934 British Industries Fair to be held from Feb. 19 to March 2.

Some weeks ago it was evident that the Fair, reflecting the present movement towards trade recovery, would be of record proportions. The latest figures show that the demand for space has continued to grow while, in response to information sent abroad, the Department reports a flood of inquiries for British goods from overseas buyers all over the world.

Up to date a total area of 796,817 sq. ft. of space has been booked by exhibitors at the Olympia, White City, and Castle Bromwich, Birmingham, sections of the Fair. Total allotments at the 1933 Fair, which itself was larger than any of its predecessors, amounted to 708,100 sq. ft., or just over two acres less than this year's display. The additional area alone this year is almost as large as the first Fair, held in 1915, when all the exhibits occupied 88,000 sq. ft.

So far more than 2000 trade buyers in various parts of the world have written to say that they will attend the Fair. At the corresponding date last year 1200 acceptances were received. A large number of overseas firms have also instructed their London agents to attend the Fair.

New L.C.C. Gas Meter Testing Station.

To be Erected at Kennington.

Representations have been made to the Public Control Committee of the London County Council by Messrs. Smith Meters, Ltd., that additional facilities for the verification of gas meters should be provided in the south of London.

Owing to the lack of adequate testing accommodation in South London, it has hitherto been necessary to verify a large proportion of gas meters submitted by firms in South London at the Finsbury office, and the Harrow Road office. The Finsbury office was erected in 1923-24 and was deemed to be conveniently placed to serve the needs of four companies manufacturing meters in North London. Three of these companies have not, however, taken full advantage of the facilities offered, the number of meters tested on their behalf at the Finsbury office being only about one-tenth of the total number of meters dealt with there, the bulk of the remainder being transported from South London.

In order to provide for an extension of Messrs. Smith Meters' factory at Kennington, the Company had obtained an option to purchase a vacant site adjacent to the premises, and it was willing to dispose of a portion of this land to the Council if the Council was prepared to erect a gas meter testing office thereon. In view of the convenience which the provision of further testing facilities on the site in question would afford the Company, it offered to make a contribution of £1500 to the Council towards the cost of the erection of such an office. The Company also

THE NEWS—continued.

gave an undertaking to submit for testing to the Council's inspectors all meters manufactured and repaired at its premises, in the event of the new office being erected.

During the year ended Sept. 30, 1933, this Company submitted 107,557 gas meters for testing—about one-third of the total received from all sources at the Council's three existing offices.

After full consideration of the various factors involved, the Public Control Committee recommended that further facilities for the testing of gas meters should be provided in South London and that the offer of the Company should be accepted. They regarded the site as suitable for the erection of an office of adequate size, which would be conveniently situated to meet other needs in South London. It is proposed when the new Kennington office is erected to close the Finsbury office.

The above recommendations were agreed to at a meeting of the Council on Jan. 23, and sanction was given for the erection of the new office as expeditiously as possible.

Institution of Gas Engineers.

Members of the Institution are invited to attend the Joint Meeting of the Chemical Engineering Group and the London Section of the Society of Chemical Industry, to be held on Monday, Feb. 5, at 8 p.m., in the Rooms of the Chemical Society, Burlington House.

Dr. J. J. Fox, Chairman of the London Section of the Society of Chemical Industry, will preside, and a paper on "The Recovery of Benzole by Activated Carbon" by Mr. H. Hollings, M.Sc., and Mr. S. Hay will be presented.

Gas-Works Assessment.

Ramsey Company's Appeal.

An objection was lodged by the Ramsey Gas Company at a meeting of the Huntingdonshire Assessment Committee against a proposed increase from £164 rateable to £275 in the assessment of their works and £10 gross for the Manager's cottage.

Mr. Newton, Secretary of the Company, produced figures showing the gross receipts from the sale of gas, &c., and mentioned that the net profit in 1932 was £815. He contended that if the undertaking were taken over by the landlord the net annual value would be £55, and on that ground he argued that the present assessment was out of all proportion.

Mr. Sidney Smith (Messrs. Weatherall & Green), valuer appointed by the County Valuation Committee, in supporting the proposed increase, said it was an axiom in the valuation of gas companies that the landlord should receive as much as a tenant, and on Mr. Newton's own showing the net profit of the undertaking in 1932 was £815. Since the last valuation the sales of gas by the Company had increased by 54%. The Company had spent £1242 in extensions and mains, and large sums in renewals and retorts. The proposed assessment was an increase of 65%.

The Committee fixed the assessment at £235 rateable for the works and £10 gross for the cottage.

London's Worst Fog for Years.

Electricity Failure Makes Confusion Worse Confounded.

The night of Jan. 24 will live long in the memories of many, particularly in the suburban districts of London, as one of the worst visitations of dense fog and resulting traffic delay in a winter already notable for its many days of darkness. All round London and in several parts of the country the fog lay so thick that travellers from many different places avowed that it was densest where they had come from or upon their route.

With the public transport services already entirely or almost at a standstill and traffic generally proceeding at a crawl or led in convoys by pedestrians, a widespread electricity failure rendered confusion worse confounded over a large area in North London. At 7.45 p.m. the light failed in the districts supplied by the North Metropolitan Electric Supply Company, and it was not restored until after 8 o'clock. The suburbs affected included Wembley, Hendon, Mill Hill, Golders Green, Hampstead Garden Suburb, Edgware, Wealdstone, Harrow, Tottenham, Willesden, Finsbury Park, Harringay, Cricklewood, and Kensal Rise. The breakdown was reported to have occurred at the Brimsdown Station of the Supply Company at Enfield.

Many motorists who had been trying to find their way home in the fog abandoned the attempt when the electric street lamps failed, and waited for the light to be restored. In Willesden flares were lighted in the streets, but there was considerable disorganization, although the police did their best with whistle signals. Tramcars, already forced by the fog to a crawl, were held up completely by the power failure, and in many of them emergency storm lanterns were lighted to prevent what traffic was still moving from colliding with them in the darkness. The L.M.S. signals between Kensal Green and Headstone Lane stations were all extinguished owing to the failure.

At Golders Green and Hendon most of the streets are lighted by gas, so that motorists were not so badly affected in these districts. When the Wood Green Borough Council were discussing the adoption of electricity instead of gas for street lighting the electric lights in the Council Chamber went out as a result of the failure—but in spite of this the Council agreed to convert to the form of public lighting which was demonstrating its shortcomings.

When the lights failed at the Wembley Sick Animals' Hospital, a difficult operation had to be completed by the light of lamps and candles.

A Smokeless Estate.

Oldham's Enterprise.

The Oldham Corporation Gas Committee have been informed that an agreement has been reached with a syndicate of builders who propose to erect 900 houses at the White Gate Garden Village, Chadderton, in which there will be no coal fire grates.

There will be coke fires on the ground floor, gas fires in the bedrooms, with a gas boiler. The choice of a cooker will be left to the tenant.

Alderman Tweedale, the Chairman, said this would be a smokeless estate—a very great thing. He was proud that their Department was associated with the project. Mr. Parry, the Commercial Manager, was congratulated on the energy he had shown in helping to bring the matter to a successful conclusion.

An Exhibition at Oxford.

An exhibition organized by the Oxford and District Gas Company was opened last Thursday by Sir Francis Goodenough at a luncheon at which the guests included prominent representatives of the City and University. Mr. H. J. Bradley, Chairman of the Company, presided, and among those present were Mr. W. E. Caton (Managing Director and Chief Engineer of the Company), Col. S. S. Ogilvie (Joint Manager of the N.G.C.), Mr. A. W. Smith (General Manager and Secretary of the Birmingham Gas Department), Mr. D. H. Helps (Engineer and Manager of the Reading Gas Company), and Mr. W. R. Day (Manager and Secretary of the Banbury Gas Light and Coke Company).

Mr. BRADLEY, in proposing the toast of "The City and University of Oxford," said that perhaps more than any other individual concern in Oxford, the Company had from its inception been closely connected with both the University and the City. The relations of the Company with both had always been of a cordial nature, and he hoped would long continue so. The Company was one of the largest ratepayers in the City, and was accordingly keenly interested in all that pertained to its welfare. They were gratified at the presence of many representatives of the University and colleges, and especially of the Master of University College, who had devoted so much time and energy to maintaining and improving the amenities of their glorious City. He would like, on behalf of the Company, to thank Sir Michael Sadler and his fellow trustees of the Oxford Preservation Trust for the counsel they had given and for their welcome assistance and advice in enabling the Company to carry out the works which the expansion of their business rendered necessary with the least possible despoiling of the landscape.

Following the response of the Mayor of Oxford (Miss Tawney), Sir MICHAEL SADLER said that many of the colleges and a great number of the members of the University, including himself, had reason to be grateful to the Oxford Gas Company for the convenience and comfort in studies, bedrooms, and kitchens, and he could assure the Company that the University appreciated the kindness of the remarks which had fallen from the Chairman. The University had always welcomed gas. It was in

1819 that High Street was for the first time illuminated with gas, an experiment which had been an immense success. They ought also to acknowledge the use which the Gas Industry made of research.

Capt. R. C. BOURNE, M.P., proposing the toast of "The Gas Industry and the Oxford and District Gas Company," said they were fortunate in their Gas Industry, and they should be grateful for the work carried on by the Industry in spite of legislative hindrances which had hampered it. To-day gas was looked upon not merely as an illuminant, but primarily as a heating and industrial asset. The number of industries which used gas for complicated and difficult processes was enormous, and he believed that it had a unique advantage in that it maintained comparatively cheaply a uniform temperature in furnaces. In the manufacture of gas, British coal, British capital, and British labour were used, and it was an industry which should be dear to statesmen in those hard times. The Oxford and District Gas Company now supplied very large areas, stretching down to Didcot in the south and to Kidlington and beyond in the north. He wished the Company a very successful future.

Sir FRANCIS GOODENOUGH, replying, said he regarded exhibitions as a most practical form of advertising. "I believe," he continued, "that there is a great future for gas and also for British trade, and it should not be forgotten that the progress of gas depends on the progress of trade, and the progress of trade depends upon the adoption of the most modern methods of production and marketing, and gas plays an important part in the economic production of almost every commodity."

The two objectives, coal conservation and smoke abatement, happily went hand in hand. Both were achieved by the same means, and by one means only—the carbonization of coal. Carbonization, moreover, while serving these national needs, served also the needs of individual fuel consumers. It could provide them with a labour-eliminating fuel gas, and with a solid fuel, coke, that was the cheapest to be obtained.

Sir Francis concluded by expressing pleasure at the opportunity afforded him of declaring open an exhibition of gas apparatus which would enable the consumers of Oxford and district to obtain the many advantages of gas by the most modern and efficient means of its utilization.

Institution of Chemical Engineers.

Annual Meeting.

The Twelfth Annual Corporate Meeting of the Institution of Chemical Engineers is to be held on Friday, Feb. 16, at the Hotel Victoria, Northumberland Avenue, W.C. 2, under the Presidency of the Rt. Hon. Viscount Leverhulme.

The morning session will be devoted to the business meeting and Presidential Address, while after lunch Prof. C. H. Lander, C.B.E., D.Sc., will read a paper entitled "Modern Methods of Attacking Heat Transmission Problems," in the course of which he will deal with some of the more important recent developments in the transmission of heat by radiation and convection and their application to practical problems, including radiation from non-luminous gases at high temperatures, and optical methods of measuring convection. A discussion will follow.

The Twelfth Annual Dinner will be held in the evening, at which many distinguished guests will be present.

Manchester and the Fuel Industries.

"The name of Manchester is so closely connected with the cotton industry that the activities of other industries such as fuel are sometimes not fully realized," said Dr. F. S. Sinnatt, M.B.E., in an interesting lecture delivered before the Manchester Section of the Society of Chemical Industry on Jan. 19, dealing with the development of fuel technology in Manchester from the beginning of the last century.

While Dalton and Henry were investigating the scientific side of the carbonization of coal and oil, said Dr. Sinnatt, Samuel Glegg established a business in Manchester as a maker of gas plants.

Mr. Lee, of Phillips & Lee (the Salford Cotton Mills), in 1804 was the first to have gas for lighting purposes installed in his house. On extending it to his mill where he had previously used candles he showed a saving of £2300 per annum. The work of Joule on the determination of the mechanical equivalent of heat, which was carried out in Whalley Range, was unique, since the fundamental laws relating to mechanical energy and heat were based upon it. Sir William Fairbairn and Hetherington obtained a patent for a boiler in 1844, known as the Lancashire boiler, a great number of which were now used in this country.

Although James Young was only in Manchester for a comparatively short time, it might be said that when he started to refine the oil from a spring in a coal pit at Alfreton in Derbyshire, at the inspiration of Binney, he entered a career which led to the development of the shale oil industry of Scotland.

"The men who have invented and carried out investigations, and have carried their work to commercial success," concluded Dr. Sinnatt, "are equally numerous. Among these are Glegg for coal gas plants; Fairbairn for boilers and general engineering; Hetherington and the Galloways who developed boilers, tools, and machinery; Simon responsible for the first bye-product coke oven in the country; West for charging machinery for gas-works and continuous vertical retorts; Dempsters' for gas plant of all kinds; Hodgkinson and Meldrum for mechanical stokers; Dowson and Mason who have developed producer plants; and such firms as the Manchester Oxide Company who treat the gas from four million tons of coal per annum, and recovery sulphur and cyanogen from it and Lowes and Hardman and Holden who have developed the distillation of tar."

Lecture to Sheffield Outdoor Staff.

The third of the series of lectures to the Outdoor Staff of the Sheffield Gas Company took place at the Company's chief showrooms on Jan. 26, when the speaker was Mr. Leopold Friedman, Chief Engineer of Messrs. Ascot Gas Water Heaters, Ltd., of 244, High Holborn, W.C. 1. There was an attendance of almost seventy, consisting of the outdoor staff of the Company, members from the Corporation Water Department, and private plumbers.

Mr. Friedman confined his remarks to the use and construction of the various types of Ascot water heaters, and emphasized the value of these appliances in new housing estates.

The lecture was illustrated by lantern slides, and at the conclusion of the speaker's remarks there was a good discussion.

Cardiff Gas Company's Athletic Club's Dance.

The fourth annual dance of the Athletic Club of the Cardiff Gas Light and Coke Company was held at the Whitehall Rooms, Cardiff, on Jan. 25. There was a record attendance of nearly 200 guests, who were entertained during the evening by Miss M. Stephens and Mr. John Shute. After supper novelties were distributed among the guests.

The dance committee, which was headed by Mr. R. G. Shute (Chairman), Mr. F. Bruford (Secretary), Mr. J. Wilde (Treasurer), and Mr. J. Bowdery (who acted as M.C.), was congratulated on the excellence of their arrangements and the success of the dance.

The chief guests of the evening included: Mr. H. D. Madden (Engineer and Manager of the Company and President of the Club) and Mrs. Madden, Mr. R. J. Auckland (Secretary of the Company) and Mrs. Auckland, Mr. Frank Boardman (Assistant Engineer and Chairman of the Club) and Mrs. Boardman, Mr. B. J. Bell (District Superintendent) and Mrs. Bell, Mr. Frank Osborne (Secretary of the Club).

The Gas Industry in Czecho-Slovakia.

According to a report lately issued there were 85 gas undertakings in Czecho-Slovakia at the end of 1932, giving employment to an aggregate of 2788 persons. Of the total, 51 works are in Bohemia, 27 in Moravia and Silesia, and 7 in Slovakia. Sixty-eight of the works are owned by municipal and local authorities and seventeen by private companies, the largest works being those of the Prague municipality which are responsible for 42·8% of the country's gas production.

As a result of the general industrial depression, the output of gas in Czecho-Slovakia during 1932 only amounted to roundly 4,295,428,000 c.ft., as compared with 4,316,811,000 c.ft. in the preceding year—a decrease of 21,383,000 c.ft. or 0·5%. Of the 85 undertakings, 47 experienced a decline in output, but, on the other hand, 38 showed an increased production.

An analysis shows that apart from those in Prague, the majority of the Czecho-Slovakian gas-works are of a relatively small character. Seven have an annual output of less than 3,530,000 c.ft., forty-three have outputs ranging between 3,530,000 and 17,650,000 c.ft.; eighteen between 17,650,000 and 35,300,000 c.ft.; fourteen between 35,300,000 and 176,500,000 c.ft., and only three over 176,500,000 c.ft.

Imperial Continental Gas Association

Retirement of Sir Henry Birchenough from Chairmanship

The retirement of Sir Henry Birchenough, Bt., K.C.M.G., from the Chairmanship of the Imperial Continental Gas Association was marked on Tuesday, Jan. 23, by a Dinner given by him at Claridge's Hotel.

Among the guests, numbering nearly fifty, were Sir Thomas Royden, Bt., C.H., Deputy-Chairman, the Rt. Hon. Sir Guy Fleetwood Wilson, G.C.I.E., K.C.B., K.C.M.G., M. Georges Theunis, G.C.M.G., M. J. Gruss, Sir George Jessel, Bt., M.C., Mr. F. H. James, Managing-Director, Sir John Chancellor, G.C.M.G., G.C.V.O., D.S.O., Messrs. S. H. Le Roy-Lewis, M. H. Tetley, A. F. P. Hayman, Major A. G. Saunders, Messrs. G. Touche, and H. Pettitt; MM. H. de Richemont, P. Couvreur, J. Delaruelle, M. Bernard, A. Mariez, L. Morel, and J. Bonnin, of the Compagnie Continentale du Gaz, Paris; MM. M. Périer, F. de Vigne, W. L. O'Connor, A. Bourlard, F. Steinkuhler, and A. Popelier, of Brussels; Mr. F. Good, MM. J. Laurencin, and L. De Wolf, Messrs. E. Dadson, H. Gandon, L. Van den Bosch, and W. Wilson, of Antwerp; Herr C. Joerger, of Berlin; Mr. W. Friebel, of Prague; Mr. J. van der Jagt, of Flushing; and members of the London staff.

A Happy Family.

After the Loyal Toasts had been honoured, the Chairman warmly welcomed his guests and said it was like the old days when each year leading members of the Association's staff used to come to London from the Continent to renew their contact with the Board and to discuss problems of common interest. It was a great joy to him that once again they had come together; as their presence convinced him that, great as had been the changes in the Association during the last ten or fifteen years, there had been no change in the most important element of all—namely, *esprit de corps*. He hoped it might never change, for as long as it continued the Association would continue to play the great rôle it had played for more than one hundred years. The Imperial Continental Gas Association was unlike any other commercial undertaking with which he was acquainted, being not a company, but an Association. The members of the staffs, great and small, had worked together rather as a fraternity than as a mixed body of employers and employed. Was it to be wondered at that he had been proud to be President of such an undertaking, or that he had hesitated to surrender to a younger man a position which gave him so much pleasure and was a source of such legitimate pride?

He had known intimately the Directors of the various Works in France, Germany, Holland, Belgium, and Czecho-Slovakia, many of whom had passed away. Happily, however, there were enough present to-night to fill his heart with gladness. He had by him Mr. Hayman, who was General Manager at Antwerp in the Chairman's earlier days. He thought of those days when last autumn he visited Antwerp and was entertained at luncheon by the distinguished Burgomaster in the beautiful Town Hall upon the renewal of the contract with the city, a renewal for which they had to thank the efforts of, among others, M. De Wolf and Mr. Dadson. Then there was Mr. Friebel, who completed fifty years' service in September last as Manager of the Prague Station. He (the Chairman) went to Prague with Sir Arthur Lucas when the Prague business was acquired, and he remembered well his first interview with Mr. Friebel when his appointment as Manager was confirmed.

Other Friends.

Others whom he must specially thank for being present were his dear friend M. Gruss, to whose advice and sympathy he had owed so much for many years; M. Couvreur, another old friend; M. Bernard, Manager of the Lille Gas Undertaking, to whom they were all greatly indebted in connection with the renewal of the Lille contract; M. Mariez, whose father he well remembered at Nancy thirty years ago; Mr. Gandon, of Antwerp; Mr. Phillips, a very old friend of the London Office, and last but not least, Herr Joerger, whom he wished to thank for coming over from Berlin to London for this celebration. The Chairman had a delightful recollection of Herr Joerger's partner, Herr Delbrueck, in early days, and of his and Madame Delbrueck's years of kindness. Indeed, he begged all his guests to believe that he drew no distinction between old friends and relatively new friends in his grateful appreciation of the splendid work they were doing for the Association. In this connection, it was impossible to exaggerate the services of his colleague, Mr. James, the Managing-Director, upon whom, from the time of his appointment, an increasing load of responsibility and initiative had fallen year by year; he was the friend and counsellor of them all, and none of them could imagine the Association without Mr. James. He could only say that had not Mr. James taken upon himself a large share of the work of the President, he, the President, could not have retained his position as long as he had done. The same applied, *mutatis mutandis*, to M. Périer, of Brussels, and to M. de Richemont, of Paris; the success of the gas and electrical undertakings in Belgium and France being largely due to their untiring efforts. The Chairman wished to tender to these three principal officers of the Association—Mr. James, M. Périer, and M. de Richemont—his grateful appreciation of their most helpful kindness to him during his years of office. He also wished to thank all the staff, both in London and on the Continent, not only for their zeal and loyalty, but also for their unfailing consideration for him personally.

Although he was resigning the Chair of the Association, he was remaining a member of the Board, in the hope that he might be able to assist his colleagues for a short time longer. It was a great satisfaction and happiness to him that his place would be taken by his friend Sir Thomas Royden. Sir Thomas' public position, his personal distinction, and his well-known ability ensured that the guidance of the Association could not be in stronger or safer hands. They had all appreciated his personal charm, while his age ensured that in a younger President they would find a higher degree of initiative and activity than he, the Chairman, had recently been able to exhibit. He wished Sir Thomas happiness in his new office, and could promise him success because he bequeathed to him a personnel of tried loyalty and exceptional experience.

Appreciation Expressed.

M. Gruss, one of the Directors of the Compagnie Continentale du Gaz, of Paris, in expressing his appreciation of the Chairman's kind remarks in regard to himself, said how delighted they all were that, thanks to his wonderful constitution, Sir Henry had made such a splendid recovery from his recent serious operation.

Mr. Hayman, speaking as the *doyen* of the Association, thanked the Chairman very heartily in the name of the guests for the splendid hospitality he had offered them. It was with profound regret that they had heard of Sir Henry's impending retirement from the Chairmanship; his personal charm, his extreme courtesy, and the kindly interest he had always taken in their welfare had endeared him to them all. He could well remember Sir Henry's visit to Berlin in 1900, when he saw arising at Mariendorf the great new works which represented the latest development in gas-works construction, redounding to the credit of the late Edward Drory, ably assisted by Mr. Hayman's colleague and good friend Ernst Körting.

Besides serving the Association and its Allied Companies with such distinction, Sir Henry had also served his country and the Empire in many ways, being, as President of the British South Africa Company, a worthy successor of the Empire builders who were his predecessors in the Chair. Moreover, the Governments of this country had often had recourse to his services, and had appointed him Chairman or a member of no less than nine different Commissions.

A Presentation.

In conclusion, Mr. Hayman asked the Chairman to accept, as a token of esteem and affection from past and present members of the staffs of the Association and its Allied Companies, and with their sincerest wishes for his health and happiness, a silver inkstand which would serve to remind him of his old friends.

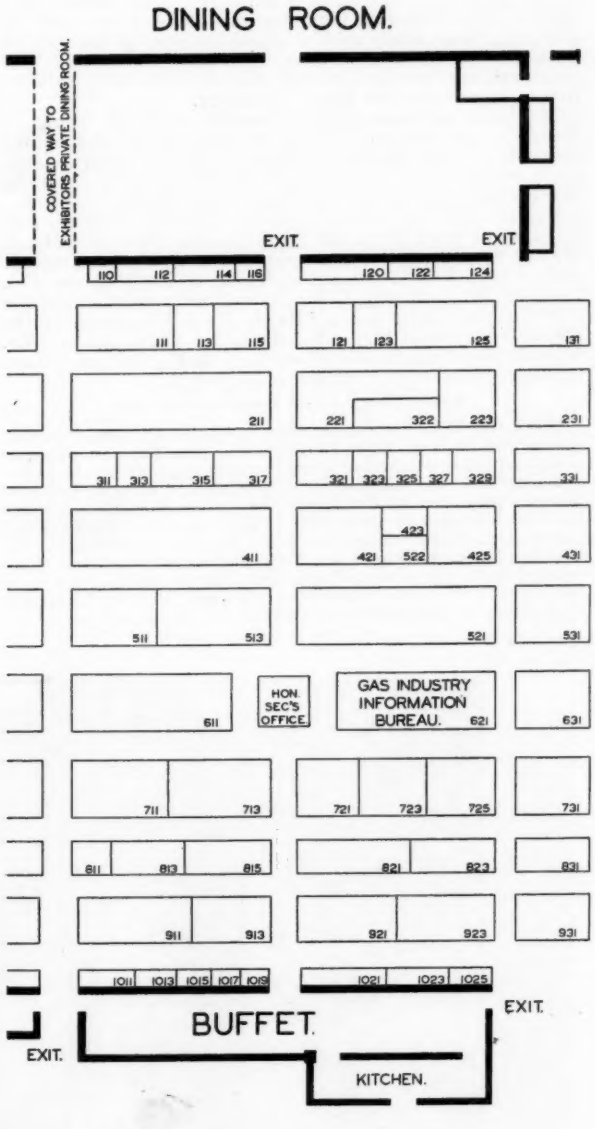
The Chairman's health having been drunk, he expressed his heartfelt thanks to all present, thus bringing a delightful evening to a close.

GAS INDUSTRIES SECTION,

BRITISH INDUSTRIES FAIR, 1934

LIST OF EXHIBITORS

Alder & Mackay, Ltd.	131
Allday, Wm., & Co., Ltd.	313
Asbestos Cement Building Products, Ltd.	631
Ascot Gas Water Heaters, Ltd.	911
Benham & Sons, Ltd.	1023
Braddock, J. & J.	322
Bratt Colbran & Co.	931
Bray, Geo., & Co., Ltd.	721
British Commercial Gas Association	211, 621
Bromford Tube Co., Ltd.	921
Cambridge Instrument Co., Ltd.	311
Cannon Iron Foundries, Ltd.	511
Cellactite & British Uralite, Ltd.	223
Chesterfield Tube Co., Ltd.	923
Clarkhills, Ltd.	114
Cowan, W. & B.	521
Dean, W. H., & Sons, Ltd.	731
Donkin, Bryan Co., Ltd.	1019
Economic Gas Boiler Co.	431
Economic Household Appliance Co., Ltd.	1015
Electroflo Meters Co., Ltd.	110
Emscote Foundry Co., Ltd.	821
Evered & Co., Ltd.	120
Flavel, Sidney, & Co., Ltd.	421
Foster Instrument Co., Ltd.	1021
Foster & Pullen, Ltd.	317
Gas Engineer, The	116
"Gas Journal," The	327
Gas Meter Co., Ltd.	522
General Gas Appliances, Ltd.	513
Gibbons Bros., Ltd.	111
Gibbons (Dudley), Ltd.	111
Glover, Geo., & Co., Ltd.	331
Glover, Thos., & Co., Ltd.	411
Grant & West, Ltd.	122
Harper, J., & Co., Ltd.	431
Holmes, W. C., & Co., Ltd.	425
Horstmann Gear Co., Ltd.	723
Hurry Water Heater Co., Ltd.	913
Industrial Research Laboratories	315
Lead Wool Co., Ltd., The	1011
Lighting Trades, Ltd.	725
Welsbach Light Co.	725
Macpherson, Donald, & Co., Ltd.	815
Main, R. & A., Ltd.	411
Maxol Heaters, Ltd.	1025
Metropolitan Gas Meters, Ltd.	121
Midland Brass Fittings Co.	325
Moler Products, Ltd.	115
New Geysers (1931), Ltd.	321
Orme, George, & Co.	813
Parkinson Stove Co., Ltd.	521
Parkinson, W., & Co.	521
Progas Co., Ltd., The	323
Radiation Ltd.	611
Russell, R., & Sons, Ltd.	123
Sawer & Purves	423
Sigma Instrument Co.	1017
Silas Hyde	113
Sofono, Ltd.	831
Stanton Ironworks Co., Ltd.	531
Stourbridge Refractories Co., Ltd.	329
Stoves, Ltd.	231
Sugg, Wm., & Co., Ltd.	221
Sutherland, A. G., Ltd.	823
Sutherland Meter Co., Ltd.	713
Timmis & Co., Ltd.	811
Tubes, Ltd.	923
Vulcan Stove Co., Ltd.	713
Walker, C. & W., Ltd.	124
Walker, Crosweller, & Co., Ltd.	112
Waterless Gasholder Co., Ltd.	125
Willey & Co., Ltd.	713
Wilson, Geo. (Gas Meters), Ltd.	711



PLAN OF THE STANDS

WITH NAMES AND POSITIONS OF EXHIBITORS

The Fair is open from Feb. 19 to March 2

BATH COMPANY'S : : ENTERPRISE : :

Opening of Up-to-Date Gas Showrooms and Offices

Bath is a city redolent of associations dating back to the earliest days of this country's history, and on acquiring one of the more modern but none the less interesting of these links with the past—namely, General Wolfe's house—adjoining the gas showrooms and offices just opened, the Bath Gas Company are to be congratulated. For they have performed a signal service to the city of Bath—not only in preserving this historic building, but in providing close by a thoroughly up-to-date and attractive service centre for their consumers.

The new premises were formally declared open on Monday, Jan. 22, by Dr. E. L. Burgin, Parliamentary Secretary to the Board of Trade, prior to which a large party of guests were entertained at luncheon by the Bath Gas Company at the Grand Pump Room Hotel.

Mr. H. Stanley Taylor, Chairman of the Company, presided, and among those present were other Directors, Mr. J. Wesley Whimster (Engineer and Manager), Mr. W. Blundell (Secretary), His Worship the Mayor of Bath (Lieut.-Col. the Hon. H. S. Davey, C.M.G.), and other members of the City Council, including Sir Harry Hatt (Chairman of the Electricity Committee), the Mayor of Chippenham (Mr. Vince), Sir Francis Goodenough, C.B.E., and Mr. Loel Guiness (Member of Parliament for Bath).

Three Departments Under One Roof.

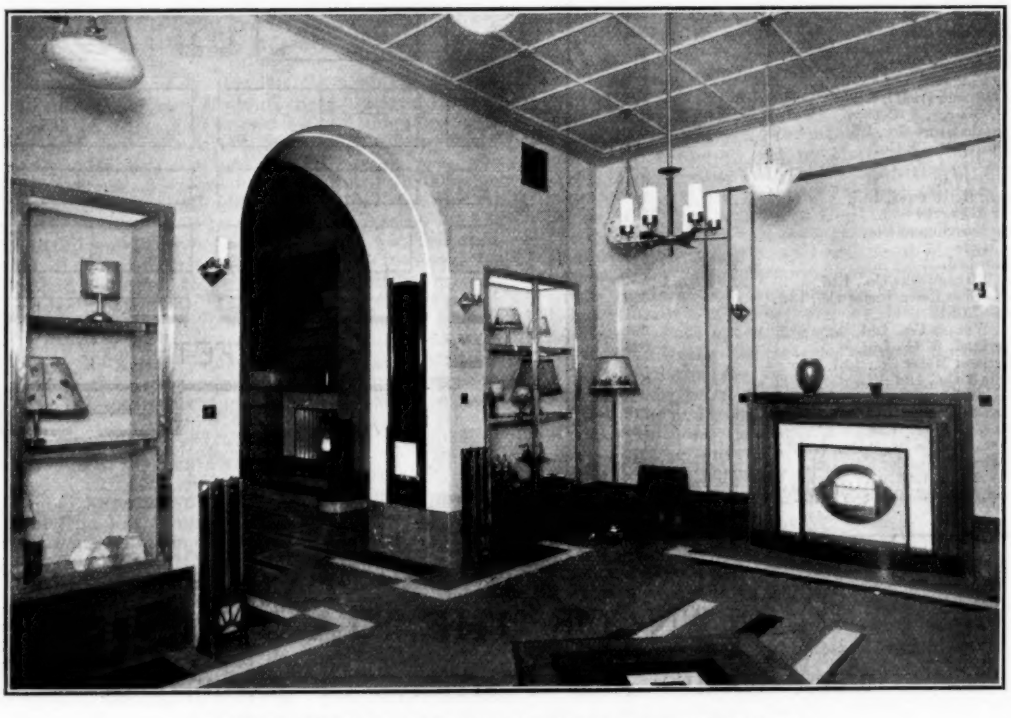
The Loyal Toast having been honoured, the Chairman, in proposing the toast of "The Guests," said that the new premises combined three departments under one roof—namely, the showrooms, offices, and distribution department. He remarked how grateful they were to Dr. Burgin for coming to open the building and how pleased they were to have so many distinguished guests with them. Referring to Sir Francis Goodenough, Mr. Stanley Taylor expressed the hope that he was completely recovered from his recent illness and that he would be spared for many a long day to carry on the great work of leadership of salesmanship which he had taken upon his shoulders.

Dr. Burgin, responding to the toast, thanked the Company for their hospitality. Continuing, he remarked that coal was the one raw material with which this country had been plentifully endowed; but they had nothing like reached a full realization of all the uses of this raw material, whether it be for producing lubricating oil or various forms of power and energy—that was for the scientists to determine. But those, like himself, who played some small part in the control and organization of industry and trade looked forward confidently to a solution of the problem by which the coalfields of this country would be visualized at their true worth.

Sir Francis Goodenough proposed the toast of "The Mayor and Corporation of Bath," and the Mayor, in response, remarked that on the Board of the Bath Company were some of the ablest business men in Bath. The existence of a business of this kind was a great asset to the City. They welcomed this increase in its business—and none the less because the City itself was a manufacturer of electricity. There was ample room for the operations of both these necessities of civilization.

Welfare of the Citizens.

Mr. Loel Guiness proposed the toast of "The Bath Gas Company," and remarked that the most important industry which any city could have was one which was concerned with the welfare of its citizens. There was no doubt about the importance of gas, the use of which had grown greatly in the course of years. The Bath Gas Company had done its best to fulfil its functions for a period of well over a century. Continuing, Mr. Guiness said that coal provided absolutely the whole wealth of this country. There was nothing which England had to sell which was not either derived from coal or owed its manufacture to energy derived from the same substance. Therefore there was nothing this country had to sell except coal, and with this they were selling labour hours. Last year 209 million tons were produced, and their potential coal production was well over 300 million tons. Therefore the more companies there were like this one the more coal would be utilized, and so the prosperity of the country would increase. He proposed the health



PENDANT ROOM IN BATH GAS COMPANY'S NEW SHOWROOMS.

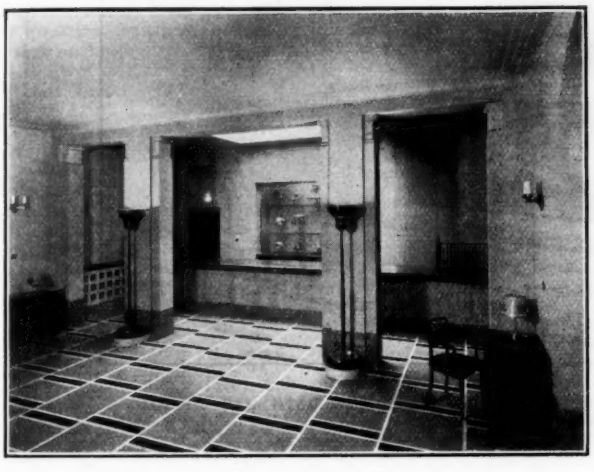
and success of the Bath Company, coupled with the name of the Chairman.

Mr. STANLEY TAYLOR acknowledged on behalf of the Board the kind way in which the toast had been accepted, and thanked Mr. Guiness for what he had said about the Company.

THE OPENING CEREMONY.

An adjournment was then made to the new premises in Old Bond Street for the official opening ceremony, which was performed by Dr. Burgin in the Lecture Room behind the showrooms in the presence of a large number of guests.

The CHAIRMAN of the Company, before calling upon Sir Francis Goodenough to introduce Dr. Burgin, voiced his pleasure, and



Inquiry Counter.

that of his colleagues, in having Dr. Burgin, the Mayor, Sir Francis, Mr. Guiness, and their other guests with them on that occasion. The idea of grouping the showrooms, offices, and distribution department together in one building was due entirely to the energy and foresight of their Engineer and Manager, Mr. Wesley Whimster. They all knew how keen he was, and the Board were wholeheartedly behind him in his efforts to economize and give greater service to the public by having these three departments under one roof. The necessity for more commodious showrooms had been before them and had been an urgent necessity for many years; the showrooms they had before were insufficient for their purposes, and did not offer the space for display which it was desirable for them to have. It was also desirable for them to have these departments in the centre of the City, conveniently situated for customers wishing to purchase apparatus. Incidentally, he would like to mention that with this site, a most interesting property had come under the control of the Company—that was General Wolfe's house in Trim Street. It would be regarded as an heirloom by the Company, who hoped to hand it down in a better state of preservation than when they took it over. He had the full authority of his Board to say that they intended to maintain this building in a good state of preservation as a historic relic.

The Bath Gas Company, continued the Chairman, had been in existence for 116 years, and it was with considerable pleasure and pride that he was able to say that, so far as he was able to glean information, it had never failed to supply gas to the inhabitants of Bath. They were proud of this record and also proud of the great advances the Undertaking had made. He would like, he said, finally, to make some reference to the Architect who had undertaken this work for the Company—Mr. Austen Hall. They were very grateful to Mr. Austen Hall for the way in which he had carried out the work. It had been a very difficult task, for he was dealing with an old building, and he thought all would agree that he had provided very suitable and attractive premises.

GOOD GAS AND GOOD SERVICE.

Sir FRANCIS GOODENOUGH congratulated Bath on its gas company and the Gas Company on its work. The citizens of Bath were well favoured in having a gas company which supplied good gas and good service; the Engineer and Manager, Mr. J. Wesley Whimster had a high reputation in the Gas Industry as a very efficient Engineer and Manager. Sir Francis knew how well Bath was served under his administration. The showrooms and offices were very typical of Bath, because Bath essentially combined all the advantages of tradition and of progress.

"I for one," said Sir Francis, "believe there is a tremendous future for the Gas Industry. It has not only got a great past but a great future. I believe the competition of electricity will have a stimulating effect on the Gas Industry. I believe there is ample room for both in the service of the nation. I don't mean in the same sphere of service. Each has its own particular sphere, and I believe gas will maintain its sphere and grow in the future."

Dr. BURGIN, after speaking of the pleasure it gave him to be there, and apologizing that his Chief, the President of the Board of Trade, could not be present, remarked that the Bath Gas Company covered a great period of history, and it was fitting that their showrooms and offices should be enshrined in a building which went back to much the same period as their own history. Dr. Burgin said he had been informed that this Company supplied 6 million therms per annum, which meant 1253 million c.ft. to 23,400 consumers. Therefore they supplied 257 therms per consumer, and the average consumption throughout the United Kingdom was 141.

That meant that they had very competent engineers, very competent salesmen, and they treated their customers very well. He heard it said by the Chairman that they supplied gas at 5½d. per therm, which he thought was the lowest price in the country. "Now," he said, producing some papers, "I have vast material supplied by the Board of Trade, and one of the pages of this memorandum consists of a list of those gas companies which claim to supply at the lowest price. It is sufficient to say there are six [laughter], and you have at least the honour to be one of them.

"Modernization of your selling organization and the premises in which you seek to sell," said Dr. Burgin; "modernization of plant and the adaptation of premises, making them beautiful as well as useful, is the real message which modern England is giving to every industry, and the Gas Industry is grasping the idea as quickly as any.

"As the result of my visit I have come into contact with modernity in some of its most charming forms. I have witnessed the utilization of some of the great coal resources of Great Britain in a practieal form, and I congratulate you, Mr. Chairman, the Directors, ex-Directors, officials, and staff —not excluding Mr. Austen Hall—from the bottom of my heart on a most pleasing and charming result. With that it is my great pride, privilege, and honour to declare open your new showrooms, offices, and distribution department."

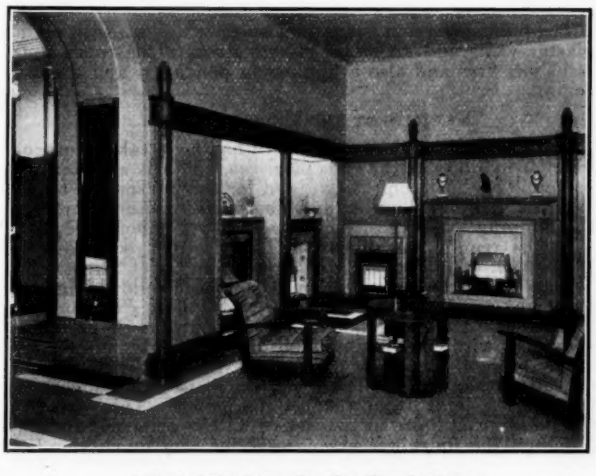
On the proposition of the Chairman a vote of thanks was heartily accorded to Dr. Burgin, after which the guests were entertained at tea and took the opportunity of inspecting the new premises.

THE NEW SHOWROOMS.

The building occupies the site of the old auction rooms, with the main entrance in Old Bond Street, and secondary entrances in Quiet Street and Trim Street.

The problem before the architects was to convert the existing buildings into showrooms, offices, and distribution department with as little rebuilding as possible. The structural parts of the old building in Bond Street are not altered, but the connecting link between this portion and the rear building is reconstructed, so that the whole forms a continuous series of showrooms and offices.

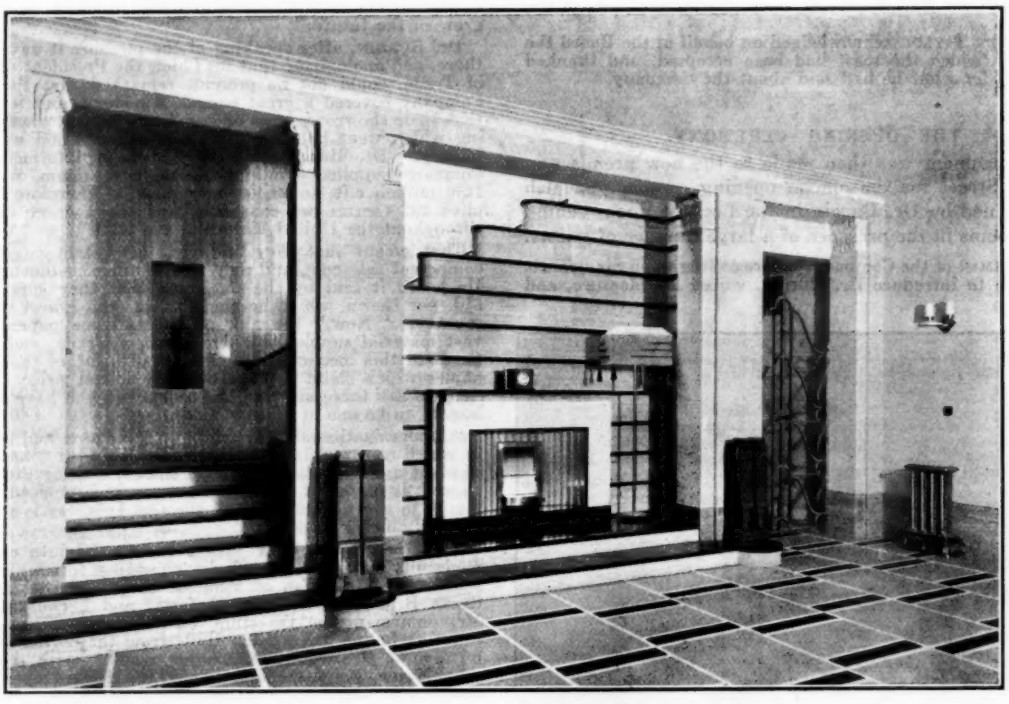
The window to Old Bond Street is designed in character with the surrounding buildings, which was essential in view of the prominent position which the premises occupy in the centre of the City.



A Few of the Attractive Gas Fire Settings.

Internally a more modern feeling has been introduced in order to express the rapid advance in the design of all branches of gas appliances, and their essential suitability for modern buildings.

Entering from Old Bond Street, the first showroom is used to exhibit gas cookers of all varieties. The floor is of Travertine marble, and the walls are of plain plaster, painted to form a suitable background. As this showroom is seen from the street it was thought desirable to make it



THE STAIRCASE—EXEMPLIFYING THE MODERN TREND IN THE DESIGN OF THE BATH GAS COMPANY'S NEW SHOWROOMS.

adaptable for changes from time to time, and for this reason any pronounced architectural treatment has been avoided.

The second showroom displays gas fires. The walls are panelled in oak, and the fireplaces are recessed with secret ceiling panels for light over each exhibit. While there is uniformity of the general treatment of the room, as much variety as possible has been made in the design of the fireplaces themselves. There is no limit to this variety except the limits of space, but sufficient is shown to give the public an idea of the wide range of fires which are now obtainable, with suggestions of suitable settings for these.

The next showroom is again treated in a different way, with marble linings on the walls and a rubber floor of unusual design, which makes the room at once cheerful and dignified.

The inquiry counter is placed on one side with a large showcase behind it for the display of silk shades and other accessories.

The final showroom is again of another design, with plain plaster walls and an inlaid rubber floor. This room contains gas fires and also a number of pendants, and a glass ceiling.

Exhibits at the Ends of Vistas.

In planning the showrooms care has been taken to provide for exhibits at the ends of vistas. This is an essential principle of showroom design, and for this reason the staircase and inquiry counter and doorways to other parts of the building are in positions of secondary importance.

At the rear of the showrooms is a lecture room to seat 100 people, with a separate entrance from Quiet Street.

The same principle of planning has been followed in the basement as on the ground floor, and galleries for the exhibition of cooking and heating apparatus have been arranged, with complete circulation for the public.

The attractive quality of gas lighting is nowhere better exhibited than in the basement, which is diffused with a warm, rich light from the ceiling panels. This part of the building is quite as attractive as the principal rooms, although the finishings are necessarily of a much simpler type.

The first floor is reached by a marble staircase on modern lines, and this floor contains the Manager's and Secretary's offices and a large room for the rental department.

This is one of the most interesting old rooms in Bath, and great care has been taken to restore the ceilings to their original beauty by careful cleaning and painting. The decoration is relieved by lines of Wedgwood blue, which was commonly used in the 18th century by the Brothers Adams in decorating their ceilings.

The second floor of the building facing Old Bond Street is used by the Directors for their Board Room, with the original panelling from their premises in Cheap Street, which has been carefully adapted for the purpose.

Heating and Ventilation.

The central heating is on the low-pressure hot water system by means of radiators, and the heat is provided by three " Ideal " gas-fired boilers in the basement. These boilers are completely automatic, the thermostats maintaining the building at any desired temperature without attention. Being in 3 units, one or more boilers can be operated according to the weather.

The boilers have a total rating of 675,000 B.Th.U. per hour.

The ventilation is on the " Plenum " system and is capable of changing the air in the showrooms four times an hour. Fresh air is introduced above the roofs at the back of the building at the rate of 316,000 c.ft. an hour. The air is then cleaned and warmed to the required temperature and introduced at suitable places in the various showrooms.

Extraction of the foul air is also provided for, and perfect conditions of atmosphere are ensured.

The illumination of the showroom windows is by means of lamps fixed above the transom level in such a way that objects exhibited are in a good light although the lights themselves are concealed.

In the first showroom three Sugg's ventilating lamps of attractive modern design have been used in the ceiling. The second showroom relies upon concealed panel lighting over the exhibits, which concentrates upon these and at the same time gives a pleasant diffused light throughout the room. The absence of overhead lighting makes the fires look much brighter and more attractive than they would do with too much direct lighting, and for the same reason all daylight has been excluded from this section.

The third showroom is illuminated with lamps fixed above the roof lights, which give a good diffusion where it is most wanted; in addition, there are a certain number of brackets and standard lamps. The fourth showroom is lighted with pendants of various designs, hung at regular intervals at intersections of the glass ceiling, and with brackets of very attractive modern design.

The large Clerks' Office on the first floor presented a special problem, owing to its architectural character. The Company particularly wished to avoid pendants in the old ceilings, which are domed in section and highly ornamented. To avoid interference with these it was decided to erect a series of standards on the floor, with indirect lighting on the ceiling. This experiment has been most successful, as it not only gives an extremely pleasant, diffused light to work by, but it adds greatly to the beauty of the ceiling, which is illuminated equally in all parts.

Sulphuretted Hydrogen Test Papers

A "JOURNAL" reader having inquired for what reasons the Gas Referees had substituted dry for moist lead acetate test papers in official testings of purity from Jan. 1, we referred the inquiry to them, and they have furnished the following note on the alterations which have been made in requirements and testing procedure from the inception of official testing for sulphuretted hydrogen to the present time.

The City of London Gas Act, 1868, and various London Gas Acts of 1869 required the gas to be "wholly free from sulphuretted hydrogen," and in order that there should be no question as to the intentions of the Legislature added "and nothing in this Act shall authorize the Gas Referees to allow of gas being charged with any amount of impurity in that form." These explicit directions, which applied only to London, impelled the Metropolitan Gas Referees to prescribe in 1872 that all the gas consumed in testing for illuminating power should be passed through an apparatus in which slips (size and number not specified) of paper "prepared" with a solution (strength not specified) of acetate of lead were suspended. Fresh test slips were to be placed in the apparatus every day. There were three testings of illuminating power every evening, and the gas passed through the apparatus would have been about 20 c.ft. In 1873 the word "prepared" was altered to "moistened." In March, 1877, the sulphuretted hydrogen apparatus was removed from the supply to the photometer and attached to the sulphur test, making the volume of gas passed through it 10 c.ft. at the rate of half-a-cubic foot an hour. Six months later the manner of preparing the papers was prescribed, the solution by which they were moistened being of one part of sugar of lead in 8 or 9 parts of water, and the papers were dried before use. The size of the slips appears by custom to have become about 2 in. by ½ in., and the number six, though the number was not definitely specified until 1898. These conditions of six dry slips exposed to the slow passage of 10 c.ft. of gas remained substantially unaltered in the London area until 1906.

Outside London the requirements imposed by the Gas-Works Clauses Act, 1871, were generally believed to be less rigorous. They were that the gas should not exhibit any trace of sulphuretted hydrogen when passed through a glass vessel containing a strip of moist lead acetate paper for a period of three minutes. The strength of the solution of lead acetate was defined (sixty grains dissolved in one fluid ounce, which is one part of crystals to eight parts of water), but the size of the strip and the rate of passage of the gas were not specified. From Jan. 1, 1906, the Gas Referees were no longer precluded by law from allowing London gas to be charged with some amount of sulphuretted hydrogen, for the London Gas Act, 1905, required the gas supplied not to exhibit any trace of that impurity when tested in a mode which should not be more stringent than that of the Gas-Works Clauses Act, 1871.

The Gas Referees, in giving effect to this requirement, specified six moist slips of paper, and a flow of gas for three minutes at the rate of about 5 c.ft. per hour. The size of the slips was specified first in 1918—viz., as about 1 sq. in. in area, which corresponded with the area of the slips which had been customary in London for many years previously.

It had been known for some time prior to 1920 that moist slips would detect traces of sulphuretted hydrogen which would escape detection by dry slips; also that with a limited volume of gas the discoloration lost intensity with increase in the area of the test paper.

The National Fuel and Power Committee in their Second Report, issued in 1929, referring to proposals for the extension to small non-statutory undertakings of the requirement as to freedom of the gas supplied from sulphuretted hydrogen, stated that they would regard any amendment of the provision of the Gas-Works Clauses Act, 1871, as a retrograde step, and went on to say: "Nevertheless we suggest that if any alleviation is possible in regard to the method of testing prescribed by the Gas Referees consistent with the retention of existing principles, representation should be made to the Referees to exercise a discretionary power in this respect."

The Gas Referees had this suggestion in mind when they doubled the area of the test slips in the latter part of 1930. It had, moreover, become apparent that moist test slips were liable to be accidentally dirtied or torn in handling before or after the three minutes' exposure, and on this account as well as with a view to some further alleviation of the severity of the method of testing the Referees decided to revert, from Jan. 1, to the use of dry test slips, which had been discarded since the London Gas Act, 1905, came into force.

The Gas Legislation Committee which reported in April last, after quoting the views of the National Fuel and Power Committee, recommended no departure from the total prohibition of the 1871 Act, but a delay of five years in its application to non-statutory suppliers of gas. The Referees have already exercised discretionary power in alleviating the severity of the test, in its application to all undertakings by (1) increasing the area of the test slips and (2) substituting dry slips for the rather more sensitive moistened paper.

CONTINENTAL NOTES

THE BOSCH SAFETY GAS SWITCH.

The Bosch safety gas switch made by Robert Bosch A.-G. is described by Dipl.-Ing. Frei in *Das Gas- und Wasserfach*, 1934, 77, 19-25 (Jan. 13).

The switch is an improvement on the usual type of safety burner as fitted to geysers, since these do not incorporate means preventing the gas from being turned on unless the pilot flame is actually alight. This feature is, however, included in the Bosch switch.

The simplest form of the new switch may be described as follows: Below the main burner is situated a flat horizontal box divided into two compartments by a horizontal diaphragm. A spring between the bottom of the box and the diaphragm keeps the latter in position. A vertical pipe passes through the top of the box, its lower end resting on and being sealed by the diaphragm, whereas its upper end is connected to and serves to convey gas to the burner. The gas supply enters the top compartment of the box at one side. At the other side is a tube leaving the lower compartment horizontally and bent upwards, the upper end being bent backwards horizontally and forming the attachment for the pilot burner. A horizontal tube containing a constricted section leaves the upper compartment horizontally and enters the previously described tube in its vertical portion. There is thus a connection between the upper and lower compartments. The pilot burner contains a valve which can only be open when the burner is warm. The device enabling this to be realized is a metal disc which bulges when warm and pulls open the valve attached to it. Initial opening of the valve is effected by the heat of a match. Subsequently, the heat radiated from the main burner keeps this valve open.

When the appliance is not in use, the pressures in the top and bottom compartments are equal and the gas supply to the burner is thus sealed by the diaphragm. However, when gas is being consumed by the pilot burner, the pressure in the lower compartment is less than that in the upper compartment due to the pressure drop created by the constriction mentioned previously. The diaphragm is therefore moved downwards and gas can pass to the main burner.

More complicated devices embodying similar principles are described and illustrated and serve for a variety of purposes. Among these is a switch enabling the gas supply to be turned on gradually, by automatic means, to the main burner, the result being silent ignition. A switch, controlled by the water supply of an appliance, is also described. Some of the switches are actuated by means of a push-button.

A nomogram which may be employed in the design of the switches is also given.

Amenities of a Rural District

Board of Trade Inquiry at Bristol

The Bristol Gas Company and the Warmley (Gloucestershire) Rural District Council were the interested parties at a Board of Trade inquiry, held at the Royal Hotel, Bristol, on Wednesday last, Jan. 24, and in which the conflicting elements were those of a large industrial undertaking anxious to meet the needs of its present and future consumers, involving certain additions to storage equipment, and a public authority anxious to preserve the amenities of a rural district.

The inquiry arose out of an application by the Bristol Gas Company for increased powers to erect on a piece of land, owned by it in the Siston district of Warmley, a new gasholder, or, alternatively, to carry out extensions to an existing gasholder; and an objection to the proposal put in on behalf of a number of residents in the vicinity by the Warmley Rural District Council.

Mr. J. F. Ronca (General Administrative Department, Board of Trade) presided, and the Company was represented by Mr. H. Royston Askew, B.Sc. (Eng.), Barrister, of London.

Sir Seymour Williams (Clerk to the Warmley R.D.C.) represented the Council, and others present were Mr. S. E. Halliwell (Secretary and Commercial Manager, Bristol Gas Company), Mr. R. Robertson (Engineer to the Bristol Gas Company), Mr. Cyril Meade-King (Messrs. Meade-King & Co., Solicitors, Bristol), Mr. G. Knowles (Deputy Town Clerk), representing the Bristol Corporation, and Capt. W. H. Knee (Surveyor, Warmley R.D.C.).

Messrs. Dyson, Bell, & Co. (London) are the Company's Parliamentary Agents.

In his opening statement Mr. ASKEW referred to the Company's history, mentioning that the Company was first launched in 1819. Through various Acts the Company was enabled and authorized to acquire land within its limits, for the purpose of the manufacture and storage of gas, and the only outstanding objection was the land at Warmley. Warmley was 5 miles due east of Bristol, and was supplied with gas from the Company's works at Avon Street and Stapleton Road, Bristol.

In 1896, Mr. Askew proceeded, the Company bought a piece of land at Warmley and erected a gasholder thereon, residents in the vicinity agreeing to the undertaking. For some years this holder had sufficed to meet the demands of the area, but of recent years this demand had increased, and the Company was called upon to make provision to meet that need.

Mr. Askew supported this statement by mentioning that during the last nine years the Company's output over the whole of its area had increased by 18½%, and that during the same period the increased output in the Kingswood, Mangotsfield, and Warmley districts—*i.e.*, those districts served by the Stapleton Road and Avon Street Works—had increased by 47%. This increase was likely to go ahead, he said, and it was therefore obvious that more storage capacity was required and greater provision must be made to maintain the required pressure. The pressure in the Warmley district, he pointed out, was greatly diminished by the intervening consumption in the adjoining districts east of Bristol.

The existing gasholder was now inadequate, and would become more so in the future, he declared, and went on to say that when it was erected in 1896 it was so constructed as to permit the addition of another lift. This fact showed the intentions and provisions the Company had made.

The proposed land was in a valley, and therefore most suitable for the purpose from the Company's point of view. It was 200 yards away from the nearest house, and not far away were a railway station, a brick and tile works, ochre and oxide works, and two boot factories.

A memorandum, signed by fifteen residents of Siston, was then put in, setting out a number of detailed objections, which included the submission that any extension to the Company's equipment would be in full view of a considerable portion of the residential part of Warmley.

The memorandum further stated "there is already erected on the land a gasholder, and the Council asks that if any further works are erected they should not be a greater height than the existing gasholder. It also asks that the gasholder, when re-painted, and any new gasholder, should be painted green. The Council also desires that the works should be surrounded by quick-growing trees so that the amenities of the district should be preserved as far as possible."

Dealing with these objections, Mr. Askew pointed out that the houses in which the objectors lived had been built recently, and therefore the tenants were not ignorant of the existence of the gasholder. He further commented on the fact that though the Company had served 65 notices only 15 residents had signed the objections.

As far as the colour of the paint was concerned, the Company was quite prepared to see that the holder, or any new holder, was suitably painted in conjunction with the R.D.C. It could not agree to the suggestion regarding trees. There was no obligation on the Company as far as that was concerned.

Coming to the question of the height of the holder, Mr. Askew pointed out that originally the holder was quite suitable for the purpose, but the Company had to provide capacity and pressure for the future.

The Company asked the Board of Trade to help it to carry out its duties and obligations and to say that the objections raised were not reasonable ones.

In conclusion, he mentioned the fact that the Warmley Rural District Council carried on an electrical undertaking of its own and was therefore a trade competitor of the Gas Company.

Called by Mr. Askew, Mr. *Robertson* corroborated details of the opening statement, and added that recently the Company had received an application from house agents asking them to make provision to supply gas to 450 houses which were to be erected at Hanham Green, which is in the Council's district.

A resident of Church Avenue, Warmley, and one of the signatories to the petition of protest, was then called by Sir Seymour Williams, and said that the effect of the erection of another gasholder would be detrimental to his property and other property in Church Avenue. A nice view would be spoiled by any additions of this character. In his opinion it would spoil the amenities of the district generally.

Replying to Sir Seymour Williams, he said that the petition of objection arose quite spontaneously from the residents of Church Avenue and was not in any way inspired by the Rural Council. With one exception the residents of Church Avenue were gas consumers.

"I should like to add," he said, "that we object to the Company being allowed to do what it likes. If we knew what the Company intended to do we should be in a better position to judge."

Called by Sir Seymour Williams, Capt. *W. H. Knee* (Surveyor to the Council) said the district of Siston had been "zoned" by the Bristol Town Planning Committee as a residential area. There was a piece of land nearby which was owned by the Council and which was to be developed as a site for "better-class" houses. All the neighbourhood was available for "better-class" houses.

Mr. ASKEW: Your Council carries on an electrical undertaking, does it not?—Yes.

Mr. ASKEW: Is it making a profit or a loss?—I cannot tell you that.

Sir SEYMOUR WILLIAMS: I can. It is making a loss as almost all new undertakings do.

Addressing the Inspector, Sir SEYMOUR WILLIAMS said the objections had not been dictated in any way by the Council. The residents of Church Avenue first made their protest to the Council, and, having been approached, the Council took the necessary steps to put forward those objections.

"We are not anxious in any way to hinder the Gas Company, and we are ready and willing to meet any competition which might come from that direction," he said.

"We do not say that nothing should be done at Siston, but we do ask that certain conditions are placed on the Company, if and when it carries out any fresh undertakings at Siston. The real trouble is the height of the gasholder to be erected, and we ask the Board of Trade to say that it should not go beyond a certain figure. We should also like some trees planted near the holder in order to preserve the amenities of the district as far as possible. We are not here in any spirit of hostility. We are only out to protect the amenities of our district, which, as I have said, is rapidly developing into a residential area."

Mr. ASKEW then made a brief summary of the Company's case, and in answer to the Inspector said that the existing holder was only 32 ft. high and with an additional lift would go to about 50 ft.

The inquiry then closed and the Inspector and representatives of the interested parties visited the site.

Hydrogenation of Coal.

Speaking before the South Wales Section of the Society of Chemical Industry recently on "The Hydrogenation of Coal," Dr. W. Idris Jones, Research Manager of the Powell Duffryn Steam Coal Company, Ltd., said: "Gone are the days when the national prosperity of this country can be based on the mining and selling of coal only. It is inevitable, setting aside the web of finance, that every effort should be made to produce oil from coal in a quantity sufficient to satisfy our own requirements for internal combustion engines, &c." Over 15,000,000 tons of coal would be required to produce the petrol alone consumed alone in this country, he added. By careful choice of reaction conditions practically all British coals except anthracite gave good yields of oil on hydrogenation.

The early work of Tropsch, Berthelot, and Bergius had been enormously developed, especially since 1929, in consequence of the use of vertical reaction vessels, multi-stage processes, continuous reaction, and selective resistant catalysts. The extent of coal hydrogenation was dependent upon temperature, time, hydrogen pressure and circulation, catalysts, and the coal variable. The temperatures used nowadays were 400°-500° C., the pressure was about 3750 lbs. per sq. in. Ordinary British bituminous coals came within the range of optimum carbon content. The bright portion of coal was more easily hydrogenated than the dull, fusain being almost non-hydrogenable.

Manufacture of Household Coke in Coke Ovens

At a meeting of the Midland Section of the Coke Oven Managers' Association held at the Grand Hotel, Sheffield, on Dec. 15, Mr. H. O. H. Cerckel gave a paper entitled "The Manufacture of Household Coke in Coke Ovens." This was published in the "JOURNAL" for Dec. 20, 1933, p. 831. Mr. M. E. Nicklin, who presided, read a contribution to the discussion sent by Dr. G. E. Foxwell.

Dr. FOXWELL wrote: I have been particularly interested in reading Mr. Cerckel's paper because, for some years, I have stressed in numerous papers and speeches the opportunity that is presented to the coke oven industry by manufacturing household coke in coke ovens. I would suggest that the term "household coke" is misleading, as it may infer domestic boiler coke. I prefer to say "open-grate coke" as expressing more aptly the type of fuel we require without mentioning how it is made. In this respect the term is superior to "low-temperature coke," which focuses too great attention upon the style of process and leads to neglect of others such as that which Mr. Cerckel describes. I would here also stress the point that the problem of manufacturing coke of the required quality and at a sufficiently low cost, important as it is, is not the only one. We must always consider how best such a coke is to be popularized and sold. The fact that only so small a quantity of open-grate coke is now sold shows how necessary this is. I would direct the attention of those interested to a paper which Mr. John Roberts and I recently contributed to a joint meeting of the Institute of Fuel and the Society of Chemical Industry. We there show what is being done and what can be done in the manufacturing of coke of the required quality in coke ovens and gas retorts by blending suitable coals. We put forward the case for co-operative marketing of all domestic coke by whatever method it is produced. This marketing should be undertaken by a central organization, perhaps on the lines of the Sulphate of Ammonia Federation or the National Benzole Company, and the coke should be sold to specification, the several grades being fixed by their combustibility, which would range from charcoal down to the hardest blast furnace coke. I regard the sale of coke to specification as one of our coming problems, and I suggest it might prove a suitable matter for joint action by the Coke Oven Managers' Association, the Institution of Gas Engineers, and the leading low-temperature concerns.

I agree with Mr. Cerckel that metal retorts are not satisfactory for producing coke cheaply, and for bulk quantities. I have carried out large-scale experiments in the production of domestic coke in coke ovens, and I agree with Mr. Cerckel that as soon as the centre of the charge has passed through the plastic stage the oven can be pushed. In order not to spoil the coke, however, it is necessary that the oven be uniformly heated both from top to bottom and from end to end, while it is even more necessary that the coke on the bottom of the oven shall be sufficiently hard. For this reason it has been suggested by one patentee that coal to the depth of a few inches shall be charged into the bottom of the oven and that only when that has been carbonized shall the whole charge of coal be put on to the top of the coke already formed. With proper blending and a uniformly heated oven discharged to a proper time schedule, it is quite possible to produce an excellent open-grate coke with a flue temperature of 1000° C., though Dr. Koppers, in a paper on the Bruay plant, preferred not to go above 850° C.

BLENDING OF THE COAL CHARGE.

I should like to lay stress upon the necessity of avoiding overheating of any part of the coke, upon the use of narrow ovens, and upon blending the coal charge. The blending provides the difficulty. Mr. Cerckel does not like the oxidation process used at Bruay. Personally, I should prefer to use the blend of coking coal with non-coking coal from the Leicestershire and Warwickshire coalfields, but circumstances may arise in which oxidation is far cheaper than transportation. Coke breeze, high in volatile matter, is an excellent substitute. A coke which contains 6% of volatile matter is always highly combustible, and combustibility is also a function of structure; and if the coke contains an adequate proportion of pores—which I have termed "micro-pores"—so small that they will readily absorb combustible gases, such as carbon dioxide, in the same manner as does charcoal, the coke will be highly reactive. All cokes containing more than 6% of volatile matter have this property, while coke made from coals possessing a high content (more than, say, 7%) of hygroscopic moisture, also possesses this property, even if they do not contain more than 1% of volatile matter—*e.g.*, Leicestershire, Derbyshire, and some North Yorkshire coals.

Mr. Cerckel refers to the ash content of the coke. The ash content of coke is another problem which we must face if we are to popularize open-grate coke for domestic purposes. It is not the question only of the quantity of ash; it also concerns the type of ash. For the boiler fire, coke made from finely crushed coal is best, since here the ash must be sufficiently fine to pass through the bars when the fuel bed is poked. Any ash larger in size stays on the bars and clogs the fuel bed. For the same reason, the ash for domestic boilers must not be easily fusible, as the formation of clinker requires the fire to be cleaned out too frequently. My own coke boiler fire is only let down for cleaning once a week, and properly handled would run double that time. For the open grate, however, fine ash is deleterious, since, when the fire is cleaned, the particles fly all over the room and settle on the furniture. One of our greatest problems is to overcome this source of "dirtiness" of coke.

There is one word of warning which I am constrained to mention, and that is that those of us who are visualizing a national smokeless fuel industry must not overlook the fact that if the Coal Utilization Council succeeds in its efforts to produce a really efficient, smokeless, coal-burning, domestic grate, the need for a carbonized smokeless fuel will be rendered a good deal less urgent. The smokeless coal grate, however, has not yet appeared, and in any event there will, for some generations, be millions of households which cannot afford the conversion, unless the coal industry is far-sighted enough to do it free of charge!

Mr. Cerckel's information regarding the bye-products obtainable from medium-temperature carbonization confirms my own. There is undoubtedly a large proportion of surplus gas available for sale, and the tar is somewhat similar to that obtained from vertical retorts. I have found that each 1% of volatile matter left in the coke represents approximately 3 therms of gas.

I am glad to notice that Mr. Cerckel does not appear to visualize a coke oven operated for the manufacture of open-grate coke for part of the year, and blast furnace for the other. Indeed, I am not at all sure that the construction of his oven would allow it, because I should imagine that when the oven is worked at the necessary high temperature for making blast furnace coke the internal walls of the heating flues, not being able to get rid of their heat rapidly, would become overheated and would melt. I regard it as essential that those who would manufacture open-grate coke should consider that as their sole activity, since the public, having been brought to use this coke by an expensive advertising campaign, will expect supplies to be available always, or they will otherwise soon lose interest. It is more difficult to recover a customer than to make one. The intermittent manufacture of hard coke nuts is not a parallel instance, for here the coke nuts are sold in a market upon which there is already some 10 million tons of gas coke annually, so that the public does not notice the few thousand tons more or less.

COMBUSTIBILITY OF COKES.

Mr. CERCKEL said that in order to limit the length of his paper he omitted a few things he would have liked to mention—for instance, the process referred to by Dr. Foxwell, whereby a certain amount of coal was charged in the oven and later some more placed on top of the coke already formed. He did not refer to that because he did not think it was a process that had a future. If they were going to have two-thirds of the oven idle for a certain period for every charging, it was not a very good proposition. Under the best of conditions the fuel could only be a mixture of high-temperature coke and semi-coke, which he did not think was in its favour. Dr. Foxwell mentioned that the combustibility in some cokes was much higher than in others, and he mentioned coke containing 1% of volatile matter. His own recent experience was that, by a misunderstanding, large coke was delivered to him, and he used it in an enclosed stove. That stove generally worked for months on end in winter time, but with that particular coke, which was a very good one, 1½ in. by 2½ in. or 3 in., he found that overnight it regularly went out. There was no poking going on and in the morning the large coke was smothered in ash.

With regard to the high temperature of the ovens and the fear of their melting down, the Lecocq ovens contained three sets of flues, and this assisted in producing the low even temperature required. There was no fear of melting owing to the header bricks being in contact with the coal at their end. This ensured an absorption of the heat and the flow of the heat through these bricks prevented their reaching anything like melting point. In fact, to have 700° C. at the face of the oven, the middle flues had a temperature of about 850° C.

The efforts of the Bruay engineers were worthy of much praise. They had no doubt achieved very interesting results, and whereas the process might be economical in France, it must first be remembered that their process was intended to replace anthracite in enclosed stoves, and the various French fuels—Carbolux, Anthralux, Anthracin, Monanthra—were sold at 50s. to 55s. at works. Here no such price could be hoped for, while large coal was sold at about 30s. at the pits. The cost of pre-heating, extra crushing and blending, handling, heat lost in oxidizing, also the much higher first cost of the plant, would absorb the margin of profit possible. If open grate coke could be made without the need of such pre-treatment, there was undoubtedly a greater future for such process.

CARBOLUX.

Mr. C. P. FINN produced some small pieces of Carbolux and also some English Carbolux made from Yorkshire coals. With regard to the combustibility of Carbolux, it was a rather reactive substance to CO_2. He did not think the reactivity to CO_2 was a measure of combustibility. That was his own opinion, but he was open to be convinced otherwise, though he was guided by practical experiments. He had tried to make fires of Carbolux. He had a quantity sent from France, and the only way he could keep it burning was to have a good fire of coke around it. He had tried it in an excellent grate, a Metro, and he had tried it in a Kempton grate. It did not

seem easily combustible, but in anthracite stoves it appeared to be a success.

Mr. CERCKEL said that in France the people used enclosed stoves, and the fuel was intended for that particular class of stove. In France a fuel was produced which was unusable in this country in open grates.

Mr. T. P. CARR said the paper was one which must have interested most of them, certainly in Yorkshire, where for some years the blast furnace coke trade had been getting less and less until just recently there had been a considerable improvement. He noticed Mr. Cerckel said the fuel must be easily ignited and as clean as possible. Those, of course, were two very important matters. He had recently come back from France, where he had seen the Bruay plant, and he was very much impressed with everything they had been doing there. The material he saw being made was not represented by the sample Mr. Finn showed them, but it was very nearly represented by the sample Mr. Cerckel sent round. It might be they had altered it slightly since Mr. Finn was there. He (Mr. Carr) saw it burning splendidly in a large number of open braziers, but he had not seen it burning in an open grate. He quite agreed with Mr. Cerckel when he said that if they displaced good house coal the fuel should contain only 3 to 4% of ash; certainly, he should say not more than 5%. After leaving Bruay he went to Nauberge to see the new Illingworth plant, which had only been working about a month. The fuel made there was very similar to the Bruay fuel. Mr. Cerckel suggested that with the Lecocq process it was not necessary to pre-treat any of the coal. He then went on to say that at the colliery where they had been carrying on the process they had been adding 10 to 20% of coke dust. Surely that was tantamount to adding an inert or a pre-treated coal. Provided the coke dust was fine enough, he had found generally that it gave the same results. Mr. Cerckel mentioned that the coal need not be crushed finer than in usual coking practice, and that coke dust and some non-coking coal could be mixed with coking coal. He would suggest that unless the blend which was added was extremely finely pulverized the product would be spoiled. However, he would like to hear Mr. Cerckel's experience on that point, because his experience had been that if either a low-temperature breeze or a coke dust was added to an ordinary coking coal which was not sufficiently crushed the product they got was certainly large but it was extremely friable.

Mr. CERCKEL said that whenever blending any of the semi-coke dusts it was necessary that the semi-coal dusts should be crushed finer than the other coal so that the pores were not so much broken up by the product which did not contain any more agglutinating power. In the case of the Bruay plant the finer the better, but there was an economic limit to the crushing, and it was very costly to crush as finely as they did there. It was better to have a coal finely crushed, but naturally the kind of coal dealt with had a lot to do with the size of the coal for crushing. Some coals would melt and combine more easily than others, but it was necessary that it should be crushed finer than the coking coal. With regard to the sample which had been sent round, that had been made up of a mixture 28% volatile coal, 70%, 20% of anthracite, and 10% of coke dust, and that had been crushed in the normal way.

Mr. CARR said the point he was making was that it was not important to make a blend.

Mr. CERCKEL said it was not necessary, and that had been proved by the plant Mr. Humphreys mentioned where they had been making coke working at fairly low temperature, and they had had no trouble with the coke.

Mr. KELLETT observed that it was stated in the paper that "one of the advantages of selling coke compared with large coal is that the bulk is greater." While this point might at first appeal to housewives, it would finally turn out to be a disadvantage in many modern homes where storage capacity was limited, and would also be a disadvantage from a transport point of view. He would like Mr. Cerckel to explain why, with low and medium temperature carbonization, there was no cleavage down the centre of the oven charge, even when considerable shrinkage from the walls had taken place. It was stated that medium temperature tar did not contain "free carbon." The majority of low-temperature tars produced between 500-600° C. usually contained from 3-4% "free carbon," and it was to be expected that under medium temperature carbonization conditions the "free carbon" content would be higher.

It was difficult to see how the capital cost of a battery of medium temperature Lecocq ovens, with its system of circulation flues, could be less than that of a high-temperature oven battery of the same throughput.

Mr. CERCKEL explained that the contraction in the medium and low temperature coke was not as pronounced as it would be in high temperature work. The plastic layer travelling very slowly when it reached the centre the two knit together in a normal way, as they would have if they had the coke from one side of the oven. The shrinkage took place in the ordinary oven at medium and low temperature at the outside of the charge; this made the gas escape easier there than through the centre.

It was difficult to go into the question of tar in detail. The Fuel Research Board experience on low-temperature carbonization was that 16 to 25 gallons of tar were obtained.

Gas Services and Their Protection from Corrosion*

By K. L. CLARK, Chief Chemist to the Weston-super-Mare Gaslight Company.

The means of assuring long life for service pipes come under the following general headings:

(1) Choice of suitable material for the tube.
(2) Protecting the pipe from internal corrosion.
(3) Preventing or limiting external corrosion of the pipe.
(4) Protecting joints, &c., from corrosion.
(5) Assuring sound longitudinal and transverse joints.

Taking the first of these items, wrought iron or steel is the material most commonly used. The work of the Wrought Iron Tubing Committee of the I.G.E., which led up to the specification for this material, is generally known. Various tests were given in the Report, for distinguishing between wrought iron and steel and for ascertaining the quality of either.

The tests have been used regularly at Weston with some advantage. The work of the Committee seems rather to have been directed towards showing that wrought iron is more suitable than steel and not to assessing the relative merits of each. The results of corrosion tests actually carried out do not prove a very marked superiority of wrought iron over steel under similar corrosive conditions. The percentage loss in weight of samples of metals tested at Weston was as follows:

Time, Hours.	Steel.		Wrought Iron.		Corrosive Agent.
	A.	B.	A.	B.	
4108	1·848	1·604	1·607	1·807	Syphon liquor
4108	1·533	1·735	1·386	1·552	Distilled water

The relative cost of steel to wrought iron is as 1 : 1·4.

You will know that shortly after this work was published the economic possibility of gas drying was demonstrated, and the Weston Company was second in the British Isles to supply dried gas to its consumers. In consequence it was deemed unnecessary to expend money on wrought-iron pipes when the damage from internal corrosion would be overcome or largely reduced by drying and the external damage by wrapping. Therefore steel tubing has been used exclusively for services.

To illustrate how slight is the corrosion of steel by dry gas a sample of ¼-in. pipe was polished and subjected to a stream passing at about 10 c.ft. per hour. The sample has not changed in weight since the test was started on Nov. 1, 1933.

Taking into consideration the initial cost of these two materials and the widely varying corrosion and protective factors, no hard and fast conclusion seems possible on this point of steel or wrought iron.

ADVANTAGES OF COPPER.

This section of my paper would hardly be complete without some reference to the potentialities of copper tubing for use in this direction. Its superior resistance to corrosion by bad soils has been demonstrated in America, and is dealt with in a very comprehensive paper by A. F. Bridge and F. A. Hough published in the *Gas Age-Record*. Thousands of feet have been used for mains as well as services, and it has been found that in spite of the higher initial cost of the copper tube it is cheaper to use under these conditions than any form of coated and wrapped tubing. The relative cost in this country of steel to wrought iron to copper (16.I.S.W.G.) is 1 : 1·4 : 2·54. A further, perhaps unexpected, advantage which was experienced was the greater throughput of copper pipe over the same size of iron or steel on account of the smoother internal surface. This allowed copper renewal tubes to be slipped through iron or steel tubes which had been corroded. With the modern trend towards higher pressures it is also interesting to know that the ordinary tube used for house piping is suitable for internal pressures greatly in excess of anything contemplated by the Gas Industry. It was considered that the nature of the gas supplied in America might cause less corrosion from inside. Dry gas should not corrode copper.

There are also certain classes of non-metallic tube suit-

* From a paper before the Western Junior Gas Association, Weston-super-Mare, Jan. 20, 1934.

able for gas services, two of which have come to my notice. The first, an asbestos-cement pipe, was laid as a small main at Weston two years ago, and has given no trouble up to date. It has the disadvantage of having a slightly larger external diameter for any given internal size than steel.

At a meeting a short while ago I saw a piece of 1-in. pipe and a socket made of asbestos compounded with one of the new types of resin. It appeared quite strong, had an excellent thread, and was of no larger cross-section than a ferrous metal pipe of the same size. The price of such pipes was unknown, but in order to keep abreast of the times and attain ideal services these developments must be borne in mind.

Mention should perhaps be made of lead, which as a material for resisting corrosion has hardly an equal among the base metals. Though it has been used for gas distribution, its weight and liability to mechanical damage are serious handicaps.

Internal Coating.

Coming now to the second item, one direction of the attack on the material of the pipe is from inside. It has been mentioned that this source is almost completely removed when the gas passing through the tube has been dried. There is a further security of covering the inside of the pipe with a protective film of oil or paint, which is a common practice. It should be said at the outset that there is little difference between these methods. In the case of oiling, a thin film of boiled linseed oil covers the metallic surface, whereas with a red oxide linseed oil paint the pigment appears to increase the viscosity of the vehicle and a thicker coat is obtained.

As a result of certain experiences arising out of internal painting, experiments were made to find the best conditions. First some pieces of metal were painted with samples of paints and oil and the times of drying noted—it seems advisable to allow the paint to set thoroughly hard before the pipes are used, because, while it may be said that the oxygen in the gas would eventually dry a paint of the linseed oil type or linseed oil itself, trouble might be experienced with entrainment at high gas velocity before this stage was reached. When the paints appeared to be thoroughly dry, the action of paraffin oil—likely to be met with in atomizing—and that of benzole, a good paint solvent present in the gas, was tried.

It would appear from the experiments that, as far as internal painting or oiling is concerned, where dried gas is supplied and the paints are allowed to dry before the pipes are laid, there will be an added security against trouble from inside. Where there is likely to be free moisture particles in contact with the paint or oil it will be softened sufficiently to admit of paint fluid in solution being carried forward by the gas, thus leaving the pipe exposed to corrosion and possibly the entrained material being deposited in undesirable places.

External Protection.

In this section it is proposed to deal principally with wrapped pipe and wrappings submitted by numerous firms to the Weston Company, and to make observations on them.

In the American Gas Association Committee's Report ("Gas Journal," Vol. 203, p. 353) on this subject it was stated that "Coating a tube is only justified where it will reduce the annual charge of the pipe line." This seems almost axiomatic, but nowadays, with the rapid development of electricity, it would appear desirable to protect all pipes against possible damage from stray currents in the future, providing a suitable method can be found. In the comments on Dr. Beck's paper at the Institution meeting last June it was stated that a current of 1 ampere passing for one year will corrode away 20 lbs. of iron.

In selecting a material for pipe protection the properties required are:

(1) That it shall be chemically inert to acidity or alkalinity likely to be encountered in the ground.
(2) That it shall be an insulator, thus preventing or minimizing attack by electrolysis.
(3) It must resist mechanical damage at the varying temperatures experienced.
(4) It must adhere well to the pipe.

So far no material has been found embodying all these properties, those most nearly approaching the specification being bitumen and pitch. The former material covers a wider range of products than does pitch. At one time it was the practice of some firms to use bitumens of the Lake type, but experience has proved them unsuitable. Petroleum residue asphaltic bitumens should be definitely specified for coating if this material is to be used.

In connection with the possibilities of pitch there are several points which commend its use, not least of which is that it is a gas-works product. It is reputed to be too brittle, but surely experiment should find the most satisfactory grade. We have found that bitumen also cracks readily. Further, pitch seems to afford better protection in the more corrosive soils. Again I would refer to the findings of the American Committee, who state that in six soil test cases of piping for wrappings, one required no wrapping, one would be suited with asphaltic or coal tar base bitumens, and four were best suited with coal tar base bitumens.

It is well known that neither pitch nor bitumen is of sufficient mechanical strength to form a reasonably thick coat which is not readily damaged. Reinforcement in the past has generally been carried out with hessian. It would appear that rotting of the hessian, in spite of bitumen impregnation, does take place. This is probably due to the moisture which material of a vegetable nature holds in equilibrium with the atmosphere at the time of use. I am of opinion that the hessian should be dried before use.

These failures have resulted in asbestos being extensively tried. It has the advantage of being a stable inorganic compound, forming a good reinforcement to bitumens. A sample of tube with an asbestos bitumen wrapping was examined at Weston and appeared satisfactory. Its use is being tried in America.

Hessian Wrapping.

The technique of hessian wrapping has also advanced. It was at one time the practice to paint the pipes with hot bitumen, bandage over this with hessian, and then paint over the hessian with bitumen. I hesitate to think what results would be given on an electric test by pipes wrapped in this way.

In those days a sample length of tube was examined for signs of faults externally, after which the wrapping was stripped off and the underside inspected. Quite extensive areas of hessian with no bitumen at all on them have been found. Times have changed, and coated pipes are now covered with one or two layers of hessian that has passed through a bath of molten bitumen, giving more satisfactory results.

The specification of a typical bitumen used in pipe covering is as follows:

Specific Gravity at 77° F.	Melting Point, B. and R. Method, °F.	Ductility at 77° F., Dow Method C.Ms.	Loss Evap., 5 Hrs. at 325° F., 20 Gramme Sample.	Flash Fire.	
				° F. Min.*	°F.
				Clev.	Open Cup Method.
1·020	215–230	2 min.	0·4%	470	560

Having, then, selected a suitable plastic material and satisfied oneself that the wrapping technique is satisfactory as far as complete impregnation of the plastic mass is concerned, the next problem which presents itself is:

(1) Whether to have a single or double wrapping.
(2) What overlap is best.

The tests given in Table 1 would indicate that double wrapping is undoubtedly better than single. However, it has been observed that when the double wrapping is used and the wrapping cracks through the length of the pipe bending in transit, or when it is handled, the crack goes right through to the metal. The final choice will therefore again be a personal matter. In Table 1 are given figures from the electric test of single and double wrapped pipe; also some special samples of single wrapping.

The electric test is a simple though effective method of finding whether the wrapping is impervious to water or not, water being the medium through which corrosion generally takes place. A sample length of wrapped pipe is insulated at one end with a paraffin wax or bitumen cup. A piece of single flex copper wire is connected at the top, and the sample is immersed in water and the circuit completed. The current is applied either intermittently or continuously, and either the current passed or the resistance to the passage of current measured.

In the test given in Table 1 the current was applied intermittently and the amount passing registered in milliamps.

The single wrappings have a ½ to 3 in. overlap. The special single wrappings have the hessian and the plastic bandage respectively completely overlapped—that is, where a 3-in. wide material is used the overlap is 1½ in. It was thought that this would be virtually a double wrapping, and, though the tests do not prove this to be so, it is probable that such a wrapping would resist damage from handling better than the single wrapping. The double wrapping has two spirals of hessian rolled in opposing directions, theoretically giving additional reinforcement.

Finally, when the wrapping is completed, this class of pipe is usually rolled in some material to make it clean for handling. If a bitumen of the right penetration has been

TABLE 1.—*Electric Tests of External Coatings.*

No. of Days	Start.	5.	10.	15.	20.	25.	30.	35.	40.	70.	100.
A Single S	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*		
B ,, S	,,	,,	0·1	0·1	0·2	0·2			0·2		
C ,, S	,,	,,	*Nil*	0·05	0·05	0·05			0·1		
D ,, N	0·2	0·1	0·1	0·3	0·2	0·2	0·3	0·3	0·3	0·3	0·2
E ,, N	*Nil*	Trace	Trace	Trace	0·1	0·1	Trace	Trace	0·2	0·4	
F Double S	,,	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	,,	Trace	*Nil*	Trace
G ,, N	,,	,,	,,	,,	,,	,,	,,	*Nil*	*Nil*		
H ,, N	,,	,,	,,	,,	xx						
Plastic X S	,,	,,	,,	,,	0·5	0·1	0·2	0·2	0·2	xx	
,, B S	,,	0·1	0·1	0·1	0·1	0·2	0·15	0·20	0·2		
,, X Co	,,	0·5	Trace	*Nil*	*Nil*	Trace	Trace	Trace	0·2	0·2	
Bitumen Co	,,	0·1	0·15	0·0	..	0·3	..	..	..	0·5	

S—Special sample. N—From normal delivery. Co—Complete overlap.

used, the danger of pipes sticking together or being sticky to handle would generally be small. In any case it would seem obvious that only a very fine dust should be used in order to prevent damage of the wrapping, which at the most is $\frac{1}{8}$ in. thick.

In the samples examined, one firm submitted a sample of tube rolled in a very coarse material, some stones penetrating the entire wrapping.

GALVANIZING.

All of you will be familiar with galvanized iron. The coating of wrought-iron pipes with zinc to reduce corrosion is practised extensively. Although I have no personal experience of its use for gas services we have in the area of this Association a Company operating over a very wide district with different soil conditions who use galvanized iron service pipes almost exclusively with entire satisfaction. My friend, Mr. R. F. Rew, of the Devon Gas Association, has kindly furnished me with this information. He assured me that no trouble has been found at the joints, which seem to be the weak point. The pipes are treated by the hot spelter process.

PROTECTION OF THE JOINTS.

Another obstacle in the road to the ideal service lies in protecting pipe joints. There are numerous ways of doing this, some of which have proved satisfactory, but involve the service layer in carrying a blow-lamp. Methods of attempting to obviate this are probably more numerous than those in which the lamp is required. Some are purely jointing materials, while others may, if desired, be used for covering the pipe as well.

Before any cover is put on the joint it must be thoroughly dried, or the water will corrode the metal under the protective material. A material which we have found most nearly satisfactory is the plastic bandage, which is made up of a closely woven material impregnated with petroleum jelly or similar grease. It makes a good joint with bitumen of the main wrapping, and embodies most of the characteristics of the ideal coating. Two results of tests of this class of material are given in Table 1. The inferior one probably failed through the wrong grease being used. In making the wrapping with it much of the grease came away on the hands; this was not the case with the other.

Four experimental wrappings on these lines were made in our laboratory. In two, a closely woven canvas and rough hessian were used in conjunction with a yellow grease. Both failed after a matter of a few hours' immersion in water, using the electric test, probably due to the action of the hard water on the soaps in the yellow grease. Similar specimens using petroleum jelly were almost as successful as the purchased materials.

Another type consists of a prepared sleeve of bitumen and a strengthening material. Before use, it is necessary to soften the sleeve by immersion in hot water, a practice which does not commend itself, if it is desired to prevent corrosion. It also necessitates hot water, which may not be readily available, while a further disadvantage is that the sleeve being large enough to go over the back-nut leaves creases, where the diameter is reduced.

A preparation which at first appeared interesting was a paraffin wax composition. Like the plastic bandage it is a good insulator and resists chemical corrosion quite well. In the tests made it was found extremely difficult to make a wrapping in which water would not creep under the laps, and at the same time avoid breaking the length of wrapping. This composition was also adversely affected by heat. A sample wrapping exposed to the sun split right down the sun side after two hours. A roll of the material was rendered useless by uniting at the temperature of the laboratory.

A method which suggests itself is to use a quick drying paint composed of pitch or bitumen dissolved in some readily evaporated solvent. The pipe could be coated with this solution, wrapped with hessian, and again re-coated and a good joint made. The obstacles which I see are that the hessian, if damp, would probably weaken the protection, also sufficient time may not be allowed for the solvent to evaporate, as this factor would be left to the discretion of the service layer.

The plastic bandage, therefore, seems to be the best "cold" method of covering a pipe joint.

THE WELD.

The weld is sometimes a source of trouble in service laying on account of the tendency to open when the pipe is screwed or bent. An hydraulic test is applied by makers with the object of detecting faults throughout the pipe length, but it does sometimes allow bad welds to pass unobserved. The laboratory tests of flattening a short sample length and etching a section of the tube with 10% nitric acid are, in this direction, both useful and interesting. In the former with steel tube the butt weld usually splits, and it can be seen whether there are any clean patches where the metal was not properly united. When a section of tube is etched with 10% nitric acid to reveal defects in the metal it is observed that there is a distinct change in structure for a short distance away from the weld. I still have an open mind as to the significance of this, but my observations seem to indicate that a shorter length of this change is found with the better welds.

Discussion.

The PRESIDENT (Mr. S. Hole) said that he thought one of the main features of a wrapping—not mentioned in the paper—was that it should be homogeneous, as a pinhole fault gave rise to intensified local corrosion. There was also, he said, a difficulty in assessing the merits of accelerated corrosion tests when considered along with corrosion of pipes in practice. He thought the Wrought-Iron Tubing Committee's tests were only useful to check quality of the supplies.

Mr. A. MARSDEN (Bristol) agreed with Mr. Hole that it was difficult to assess pipes on an accelerated corrosion test. He thought the remarks on copper interesting, and asked what method had been used for joints, and whether, with a soldered joint, galvanic action taking place was serious. He mentioned the potentialities of the new type of resin varnish for internal protection. He had done tests of internal coating, from which his conclusions were very much the same as Mr. Clark's. With regard to galvanized pipe he thought trouble would be experienced where the pipe grips damaged the zinc coat, thereby setting up an electrolytic cell. He also mentioned that the results in Table 1 would be more useful if extended over a longer period.

Mr. G. F. J. MURRAY (Plymouth) asked if service pipes had been made of bakelite. He also expressed the opinion that stones would damage a plastic wrapping, thereby rendering it useless.

Mr. A. R. LANGFORD (Plymouth) asked if Mr. Clark had any experience of the use of pitch-sawdust-bitumen mixture in wood troughing as a pipe protection.

Mr. S. S. LLOYD (Weston-super-Mare) asked if the author had heard of special steels or special metals such as those used for compressed gas cylinders being used for service pipes.

Mr. JAMES TAYLOR (Weston-super-Mare, Engineer and General Manager) said he knew of the type of pitch troughing Mr. Langford was speaking about, but he found workmen disliked it because they had to carry sawdust and pitch, &c., with them and mix it on the spot. There was also the difficulty of supporting the troughing. He also mentioned the use of lead service pipes, and wondered if one of the Bristol members could tell him whether there was any other reason than sagging for their use being discontinued at Bristol.

Mr. G. C. GUNSTON (Bristol) said he thought that care should be taken in placing too much stress on "bench" tests of wrapping. The damage caused when laying a pipe, and when other users of the subsoil laid services, frequently caused irreparable damage to wrappings. He thought Mr. Taylor was correct; sagging was the chief reason for giving up lead.

Mr. CLARK, in reply, stated that time had been one of the chief factors, as it was only about 150 days ago when much of the work given in the paper had been started. No definite conclusions could therefore be made, but the principal object of

the paper was to create a discussion and this had been achieved. Regarding corrosion with copper soldered joints, much information was given on this subject in the American paper. There was a case where copper had been used to replace single wrapped steel tube which was corroded through in 4 years. The copper tube replacing this was examined after 4 years, and, as a result of the corrosion to that date, the life was estimated at 30 years. Generally the corrosion at the joint was less than that in the main pipe, so that there should be little trouble from this.

With regard to galvanized pipes it was possible that the paint from the jointing preserved the pipe, but no more trouble was found at the joint than elsewhere.

Dealing with bakelite pipes, it was pointed out that this was the name of one of many resins which might be suitable for gas services. The danger of stones damaging plastic wrapping was overcome by seeing that the material close round the pipe was free from stones or sharp hard material. With regard to Mr. Langford's point, it was considered that the method he had mentioned was one of the successful one's for protecting pipes, but it had the disadvantages outlined by Mr. Taylor. No information was available as far as special steel pipes were concerned, but it was considered that such pipes would be equally as costly as copper. It did not follow that high mechanical strength meant good resistance to corrosion.

Speaking of the criticism of laboratory tests, it was certainly disappointing when every care had been taken to select a well prepared wrapping, if this was damaged through the carelessness of a labourer.

A vote of thanks to the author of the paper was proposed by Mr. HOLE, seconded by Mr. GUNSTON.

The Position of Gas-Works Bye-Products in Australia*

By R. S. ANDREWS, B.Sc., A.M.I.Chem.E., Melbourne.

(*Concluded from p.* 207.)

Tar is the bye-product that is presenting the greatest difficulty at the moment. It is a well-known fact that tar from continuous vertical retorts is inferior to the tar produced from the older horizontal and modern intermittent installations, although the precise difference does not appear to have been thoroughly understood by tar distillers. In the laboratories of the Metropolitan Gas Company this problem has been subjected to a thorough and exhaustive investigation. Numerous compounds and groups of hydrocarbons have been isolated and quantitatively determined in order to ascertain the exact difference, with the object of discovering why vertical retort tar is inferior, and if possible of rectifying this inferiority.

It has been observed that the tar from intermittent systems consists mainly of hydrocarbons and compounds of the aromatic series, while tar from continuous vertical retorts is contaminated with a large percentage of hydrocarbons from the waxy or paraffin series. This is decidedly detrimental in two ways. First, the valuable products that were prepared from horizontal tar for chemical and manufacturing purposes in their pure state exist in a smaller percentage in vertical tar, and can be prepared only with great difficulty free from paraffin contamination. Secondly, the paraffin and aromatic series are liable to separate under certain conditions after exposure on the road, resulting in disintegration. This separation is apparently due to alteration of some of the aromatic compounds by oxidation and polymerization, the products of alteration being insoluble in the paraffins, resulting in the well-known "swealing of waxes."

Other differences noted are that vertical tar contains a higher percentage of unsaturated compounds which are unstable, and a higher percentage of high boiling phenolic bodies which absorb oxygen and accelerate disintegration. The presence of low melting point waxes also renders the tar more susceptible to changes in temperature, which is a decided disadvantage in roadway construction.

Many people in Australia have wondered why this problem has not been tackled with more definite and convincing results in England. The two positions, however, are not altogether comparable. The volatile matter in Maitland coal is liberated at a lower temperature than from English gas coals, resulting in less cracking and a higher percentage of primary paraffins in the tar. In addition, they have large quantities of coke oven and horizontal tars to blend with their vertical tar. This last practice, however, is only postponing the evil day, and one cannot refrain from expressing a little disappointment that more help has not been forthcoming from the Mother Country.

The position is, then, that we have larger quantities of an inferior tar; how then are we going to dispose profitably of this bye-product?

There are three main possible avenues by which tar may be disposed:

(1) In road construction.
(2) As a liquid fuel.
(3) As a gas enricher.

TAR IN ROAD CONSTRUCTION.

If we were to be quite frank, it must be admitted that with all the work that has been conducted in this country on the preparation of road tars very little in excess of 50% of our tar production is used for this purpose; and yet, if all the tar produced within the Commonwealth were used for road purposes, it would not supply one-half of the requirements of road engineers.

This set of circumstances is not entirely due to the fact that vertical tar is less suitable for road construction than horizontal or coke oven tar. Two very strong influences outside the control of the Gas Industry have brought about this state of affairs. First, the dumping of cheap bitumen within the country, and, secondly, the changed methods of road construction to which this "dumped" bitumen is more suited than tar.

Last year's contract price for bitumen to the Victorian Country Roads Board was £6 10s. per ton, and this year's £6 14s. 2d., and if the duty on containers is removed, as is contemplated, the price will be about £6 4s. per ton. This price includes containers, 10% duty, freight, exchange, primage, and insurance.

For the penetrated roads, distilled tar was quite suitable, at any rate for the penetrating binder, if not for the seal coat, but with the extensive road construction programmes now being executed in the sparsely populated regions of the country such expensive methods of construction are unwarranted. On the other hand, earth and gravel roads demand high maintenance costs, so cheap light traffic black roads are now being constructed. These consist of non-rigid gravel roads primed with a thin priming tar, on the surface of which is built up a flexible bituminous mat. Any movement of these non-rigid roads must be taken up by the flexibility of the surface binder, even several years after application. Tars, whether vertical, horizontal, or coke oven, do not yield satisfactory results with this type of road construction; even Californian bitumens are barred, and only the very best bitumen can be used with impunity under these conditions.

In the cities, heavy traffic conditions are demanding changed methods of construction to reduce maintenance costs, and the use of bitumen is more economical for surface work and sheet asphalt.

It is quite evident that, if we were dealing entirely with horizontal retort tar, we would be selling very little, if any, more for road construction than we are at the present time. Road engineers have become accustomed to bitumen; they realize its superior properties in connection with modern methods of road construction and heavy traffic conditions, and nothing else is acceptable to them. How, then, can we so improve tar as to increase its use in modern road construction?

Recent processes developed in England, such as Cooke's process for production of road tars directly from the hydraulic main, and the T.I.C. process for efficient and continuous distillation of tar over a lead bath, have merely improved the mechanical production of distilled tar; they have in no way improved to any extent the constitution of the tar itself.

The first person to realize in a practical manner the vital necessity of a constitutional alteration was Mr. Tindale, when he introduced the Dura-Tar process, in which the paraffin content was reduced by steam distillation in the soft pitch, until the petrolene to asphaltine ratio reached a pre-determined figure. Many millions of gallons of this product have been used successfully, and there are some penetrated rigid roads in Victoria to-day that have been down for five years and are still in excellent condition. The fact that Dura-Tar is not sold to any extent at the present time is due more to changed methods of road con-

*From a paper before the Seventh Convention of the Australian Gas Institute.

struction, the requirements to meet heavy traffic conditions, and bitumen competition, than to its unsuitability for road construction. Several gas companies, municipalities, and distillers have made attempts to improve distilled tar by the addition of oil bitumen and natural asphalts, and have met with very indifferent success. With continuous vertical retort tar from Maitland coal, oil bitumens tend to separate after a brief period of exposure on the road.

When a natural asphalt is mixed with distilled tar it increases its adhesiveness and glossy black appearance, but most of the natural asphalts used have been too hard, and to counteract this hardness more of the lower boiling oils have been allowed to remain in the tar. When these evaporate on the road, a very hard and brittle pitch remains, which tends to crack. If, however, one of the softer asphalts is used, such as Trinidad, and fluxed with a suitable medium that is completely soluble, and will not readily evaporate, considerable improvement can be made in the tar.

As you are doubtless aware, the Metropolitan Gas Company has attacked this problem in a different angle, in the production of their road binder, Bitural.

Primarily, this product was produced by the polymerization of unsaturated hydrocarbons in the tar by air blowing, and formaldehyde condensation of the tar acids. The cost of formaldehyde proved a disadvantage, and also the resultant product showed signs of oxidation. The procedure was improved by the production of an aldehyde *in situ* (acrolein) from the decomposition of vulcanized triglycerides. Only a proportion of this vulcanized material is decomposed, the remainder serves to inhibit oxidation and soften the pitch, imparting to it greater ductility and adhesiveness.

A proportion of natural asphalt or fatty acid pitch is added to the tri-glycerides.

In Table 1 will be seen a comparison of the properties of distilled tar, Bitural, and bitumen.

TABLE 1.—*Comparison of Properties of Distilled Tar, Bitural, and Bitumen.*

—	Ditsilled Tar.	Early Bitural.	Present Bitural.	Bitumen.
Penetration	200 at 68° F.	218 at 68° F.	212 at 68° F.	200 at 77° F.
Ductility at 77° F.	68 cm.	85 cm.	110 + cm.	110 + cm.
Free carbon	14 %	11 %	9 %	*Nil*
Oils boiling to 300° C.	15·5 ,,	10 ,,	8 ,,	*Nil*
Pitch penetration at 77° F.	35	55	186	200
Pitch ductility at 77° F.	25 cm.	40 cm.	110 + cm	110 + cm.
Arc weathering test	27	45	70	82

Large quantities of Bitural have been used by the Victorian Country Roads Board throughout the State. In 1926 this public body used only 2 tons of tar, while their 1933-34 contract is as follows:

	Tons.
Bitumen	8000
Bitural	2000
Priming tar	2500
Tar oil	450

It will be noted that Bitural is the only prepared tar used, the reason being that their tests definitely show other tars to be inferior. While the Country Roads Board have been exacting in the extreme with regard to their drastic and rigid specifications (which would cause consternation if presented to the tar distillers in England), they have endeavoured, in spite of changed methods of road construction and low bitumen prices, to utilize tar products to the best advantage where possible, without loss of efficiency, and have compelled their contractors to produce what is very probably the most uniform tar product in the world.

If the Roads Boards of the other States and metropolitan municipalities used the same proportion of tar, the problem of disposal would disappear.

Table 2 shows the sales of Bitural in Victoria.

TABLE 2.—*Bitural Sales.*

	Galls.
1929	42,871
1930	331,147
1931	817,888
1932	629,300
1933	700,000*
Total	2,521 206

* Estimated on present contracts.

The Australian Gas Light Company have gone further in their attempt to replace bitumen in the production of Duratenax. In this product, the inferiorities of tar are obliterated in an overwhelming proportion of bitumen. We understand the composition is 40% tar pitch and 60% bitumen. The possibility of separation has been overcome by the removal of the tar oils and the large percentage of bitumen added. Undoubtedly, this is the best tar binder, if it can be called such, produced in Australia, and its properties compared with bitumen can be seen in Table 3.

TABLE 3.—*Comparison of Properties of Bitumen and Duratenax.*

—	Duratenax.	Bitumen.
Penetration at 20° C.	112	98
Ductility before arc exposure	35 cm.	110 cm.
Ductility after arc exposure	7·6 ,,	21·7 ,,
Arc weathering test	81	80

The best bitumen was selected for this comparison; in the case of the other bitumens Duratenax appeared to be superior in every respect.

The results, on recent samples submitted to the Roads Board, have shown that Duratenax can be improved by the addition of Bitural pitch instead of distilled tar pitch, to an extent as will permit the tar percentage being increased to 50% without reduction in quality.

Although large quantities have been sold in the municipalities of Sydney with excellent results, very little has been sold in any of the other States, the reason being that its price is too high.

The Victorian Roads Board have used very little Duratenax, and have never included it in their tenders on account of the price and for the further reason that, if they use a priming tar, first seal coat of Bitural, second seal coat of bitumen, they use a larger percentage of local material than if Duratenax was used throughout, the road being just as good, and of cheaper construction.

It would appear that the correct sphere for Duratenax is in the construction of roads for heavy city traffic, as it is now being used in Sydney, where it can be obtained hot in bulk, without the cost of containers, and where municipalities have to pay a higher price for bitumen than the Roads Board, who purchase in large quantities.

In our opinion, taking everything into consideration, Bitural offers the best possibility for tar disposal as a road binder, but the ideal set of conditions would be for these two products to be used in conjunction in the special sphere to which each is best adapted, so as to present the cheapest and strongest competition to bitumen.

Before leaving the subject of tar for road binders, it must be quite evident from the remarks relating to the constitution of tar, that specifications involving only such physical properties as specific gravity, distillation range, melting point, penetration, viscosity, &c., are absolutely valueless as a gauge of the quality of the road material. These are necessary, however, to distinguish between the various grades, but how shall we distinguish between a good road tar and a bad road tar, provided they both comply with the specifications at the time of preparation? Here are two suggestions:

(1) An accelerated weathering test. The Victorian Country Roads Board have developed a test on these lines. Samples are spread in an even layer 1 mm. in thickness on a steel plate heated to 150° F. This is exposed for a period of 20 hours, in a humid atmosphere at a temperature of 150° C., to the action of ultra-violet light from a soft carbon arc flame. The height of the carbons above the sample is 12 in. A sheet of "Vita" glass 0·075 in. thick is to be interposed between the flame and the sample. After this treatment, the penetration with a standard needle, 100 grammes at 5 seconds, shall not be less than 50 at the temperature at which the penetration of the original sample was 100.

(2) An ultra-microscopic examination of the number and state of the carbon particles per unit volume. In the opinion of those who have made an extensive study of the colloidal nature of tars and asphalts, the binding power which determines the mechanical stability is largely due to the number and state of protection of ultra-microscopic particles which form a dispersed system presenting an enormous total area. These ultra-microscopic particles do not clog or settle, because they are enveloped in protective bodies, and only high temperatures or chemical reagents can destroy this protective bond. In the case of bitumen and asphalts, the state of protection is more perfect than in tars; thus tars deteriorate more readily if overheated. A high carbon particle number indicates that these particles are well protected, fine, and well dispersed. The more carbon particles per unit volume, the better suited is the tar for road binding purposes.

The following figures have been obtained from common road binder:

	Million per C.c.
Crude tar	40
Distilled tar	400
Bitural	70,000
Bitumen	200,000

The Netherlands Roads Board have included this test in their specifications, and it is one that is worthy of very

serious consideration by those who are engaged in the production of road tars.

Tar as Liquid Fuel.

Tar finds a ready market as a liquid fuel provided the price is low enough for it to compete with fuel oil. Advantage has been taken of this market by gas undertakings who have a large surplus of tar above what is required for road purposes.

While the disposal of surplus crude tar as a fuel may be convenient, the return is small, and must only be regarded as an expedient until some better method is forthcoming.

Viewing this method of tar disposal in a broad sense, it would appear that the market may at any time become precarious.

Tar Cracking.

We have carried out some interesting investigatory work at West Melbourne in a small pilot plant capable of a throughput of 50 galls. per day on the cracking of tar to gas. The small experimental installation consisted of four retorts, two superimposed over the others, and capable of being controlled within very narrow ranges of temperature. Tar is permitted to enter the top retorts, which are maintained at a temperature sufficiently high to distil it to coke, which is collected in trays. The oil vapours mixed with steam pass on to the lower and hotter retorts, where cracking takes place to gas and a heavier tar. The success of the operation depends entirely upon the rate of feed and temperature. If the feed is beyond the capacity of the plant, pitch blockages will result; the same will occur if the temperature of the cracking retort is too low. Again, if the temperature of the cracking retort is too high, immense quantities of fluffy carbon are formed, which cause trouble within a brief period. If, however, suitable conditions are maintained—and we have achieved this with very little trouble—vertical tar can be cracked to gas, and a tar superior to coke oven or horizontal tar obtained.

The following are the results from the experimental plant, per gallon of tar:

Gas, 55 c.ft. of 1400 B.Th.U.
Pitch coke, 1·6 lbs.
Crude benzole, 0·1 gallon
Residual tar, 0·26 gallon

Analysis of Gas—

CO_2	0·6
O_2	0·3
C_nH_m	32·7
CO	7·3
CH_4	45·2
H_2	10·8
N_2	3·1

Analysis of Pitch Coke—

Ash	0·25
Volatile matter	8·00
Fixed carbon	91·75

The tar produced is similar to that obtained from cracking tar in a water gas plant generator, and is highly aromatic. The deleterious paraffins are entirely absent, unsaturated hydrocarbons occur only in the lower fractions, and it is comparatively low in free carbon, most of this material being retained as coke in the vaporizing retort.

It may be well for a moment to consider the properties of this tar, as it is likely to be a prominent commodity in the future. Whether this tar is produced in the water gas generator or in cracking retorts, the constitution is similar. The most profitable way of utilizing vertical tar is for gas enrichment, and with more extensive production of water gas larger quantities of this residual tar will be produced. Furthermore, it is a more valuable product in every way than vertical tar—it is rich in benzene, toluene, xylene, phenol, naphthalene, and anthracene, and should be welcomed by the tar distillers as a very profitable distilling stock.

Tar Bye-Products.

The one bright spot in the operations of tar distilleries at the moment is the prices being obtained for tar oils.

In Victoria, prices ranging from 6d. to 1s. per gallon are being obtained for crude, unwashed fractions. The changed methods of road construction have called for large quantities of tar oils for fluxing and cutting back bitumens and Bitural, bringing an additional market for nearly 200,000 gallons per annum. The market for disinfectants, sprays, &c., is on the increase, and the demand this year has been considerably in excess of the supply.

Another feature that has the possibility of rising to prominence in the near future is the production of synthetic resins. Australia imports synthetic resins, manufactured from tar derivatives, approximately £100,000 worth per annum, and the time is rapidly approaching when they will have to be produced locally, as their uses are extending at a phenomenal rate. Such an industry would consume large quantities of phenols, cresols, naphthalene, cumarone, indene, styrene, and their homologues, providing additional markets for the products of the tar distiller.

Benzole.

For those companies who are still operating under a lighting standard, the removal of benzole from the gas is out of the question, and for those operating under a calorific standard is not as attractive as it may first seem. Although vertical gas from Maitland coal is rich in light oil, the unsaturated hydrocarbon content is high, involving high washing cost and losses. In fact, the loss on washing with sulphuric acid is in the region of 20%.

The following figures show the value of benzole as motor spirit and benzole as gas:

The Benzole Therm.

	Per Therm. d.
Solid in coal	4·5
As gas entering benzole plant	5·44
As liquid motor spirit	10·55
Bulk consumer pays	15·30
Profit	4·75

From this profit of 4·75d. per therm has to be deducted interest, depreciation on plant, repairs, and overhead and handling charges. These deductions would not leave the margin of profit a very attractive figure.

When viewed in a national spirit, the recovery of benzole becomes an entirely different matter. Australia is almost entirely dependent upon overseas for her motor spirit supplies, as only about 1,500,000 gallons of motor spirit are produced in the country annually. If the twelve largest gas undertakings recovered their benzole, the total production would be approximately 3,000,000 gallons per annum.

In view of Australia's isolation, the question of benzole recovery is undoubtedly one for careful consideration.

Sulphur.

Sulphur, in the form of hydrogen sulphide, always has occurred in coal gas, and always will, whatever the future developments may be, and it is strange that more efforts have not been made to recover this easily marketable commodity. Spent oxide is being sold by some gas companies to sulphuric acid manufacturers, but owing to contamination with oils, cyanides, thiocyanates, &c., it is not as acceptable to them as native sulphur, and the calcined oxide has such a low activity that whether it is worth the cost of handling again in the purifiers is open to question. We are definitely of the opinion that it does not pay to handle oxides of low activity.

The best method of sulphur recovery would be to install one of the wet purification processes, in which sulphur is recovered in the elemental state; but practically all Australian works adopt dry methods of purification, and naturally are loth to scrap existing plant. Several large gasworks in Germany are recovering sulphur by means of activated carbon. By this means over 800 tons of sulphur are recovered in Germany per annum.

The Gas Industry in Australia could produce over 6500 tons of sulphur per annum, the recovery of which should prove beneficial both to the country and the Industry.

Considerable work has been carried out in this connection in the laboratories of the Metropolitan Gas Company, and we have been successful in removing the free sulphur from spent oxide, leaving this oxide in a more active state than when purchased. The sulphur is recovered in a combined state, and in the form of a readily marketable product.

Conclusion.

From this survey it will be realized that the Gas Industry is suffering from over-production of bye-products, but is in the fortunate position of being able to regulate its supply. By a progressive policy in gas manufacture of converting coke and tar into gas as far as is commercially possible, the market for these two products can be regulated, and the quality of the latter improved. The more coke and tar that are used, the less coal to be carbonized, and, consequently, a smaller quantity of ammonia will be produced, which can be directed into the more profitable channels. There are no technical obstacles in the way of benzole recovery; its removal from the gas for sale as motor spirit appears to be more a matter of policy than of value to the Gas Industry.

The recovery of sulphur, which has been somewhat neglected in the past, should be given more prominence in research in the future.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The American situation led to uncertainty in most markets last week, and this feeling will doubtless continue until the effect of the United States Equalization Fund becomes apparent. British Funds and other high-class investment securities which up to a short time ago were the centre of attraction became subdued, though prices did not suffer to any great extent. The general trend was for activity to shift almost hourly from one section to another; Home Rails, rubbers, and gold-mining shares being the most popular.

In the Gas Market the volume of business was a trifle less than the previous week, but prices with few exceptions remained unchanged. Montevideo stock was again in demand, and the price advanced a further 5 to 65. Maidstone 3% debenture and Wandsworth 5% debenture both showed gains of 2 points, while, on the local Exchanges, Bristol ordinary and Newcastle £1 units rose 1½ and 3d. respectively. The only two reactions occurred in Gas Light units with a drop of 3d. to 27s., and in Imperial Continental ordinary, which finally closed 5½ down to 215.

The following are among the first of the final or half-yearly dividends to be proposed for the past year and relate to the three Metropolitan Companies. The rates for the full year are the same as those paid in each case for the year 1932: Gas Light and Coke Company, £2 16s.% for the half-year to December, making £5 12s.% for the year; South Metropolitan Gas Company, a final dividend of 3½%, making 6% for the year; and the Commercial Gas Company, a final dividend of 3¼%, a total of 5¾% for the year 1933.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Jan.* 29.

There are no changes to report in the prices of tar products, which remain as follows:

Pitch is about 62s. 6d. per ton f.o.b.

Creosote, 3d. to 3¼d. per gallon.

Refined tar, 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole, about 3s.; pure benzole, 1s. 10d. to 1s. 11d.; 95/160 solvent naphtha, about 1s. 9d.; and 90/140 pyridine bases, 5s. 6d. to 5s. 9d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Jan. 29.

The average prices of gas-works products during the week were: Gas-works tar, 24s. to 29s. Pitch—East Coast, 59s. to 61s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 59s. to 61s. 6d.* Toluole, naked, North, 2s. 3½d. to 2s. 5½d. Coal-tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 6½d. to 1s. 7½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2¾d.; low gravity, 2d. to 2½d.; Scotland, 2½d. to 2¾d. Heavy oils, in bulk, North, 3¾d. to 4¼d. Carbolic acid, 60's, 2s. 1½d. to 2s. 2½d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Jan.* 27.

The position in this district remains unchanged. Prompt supplies of liquid products are scarce with prices steady.

Crude gas-works tar.—Actual value is 36s. to 38s. per ton *ex* works.

Pitch.—Price is nominal at round 52s. 6d. to 55s. per ton f.o.b. Glasgow for export, and 52s. 6d. per ton *ex* works for home trade.

Refined tar is being held for 3¼d. to 3⅜d. per gallon f.o.r. in buyers' packages.

Creosote oil.—Quotations continue steady. B.E.S.A. Specification is 4d. to 4¼d. per gallon; low gravity, 4d. to 4¼d. per gallon; and neutral oil, 4d. to 4¼d. per gallon—all in bulk *ex* works.

Cresylic acid.—Prices are steady. Pale, 97/99%, is 1s. 1d. to 1s. 2d. per gallon; dark, 97/99%, 11d. to 1s. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 5d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—To-day's value is 4¾d. to 5¼d. per gallon, according to quality and quantity.

Solvent naphtha.—90/160 grade is 1s. 6d. to 1s. 7d. per gallon, and 90/190 quality is 1s. per gallon.

Motor benzole is nominal at 1s. 7d. per gallon *ex* works.

Pyridines.—90/160 grade is 4s. to 4s. 3d. per gallon, and 90/140 grade is 4s. 6d. to 5s. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 10	to	0 10½	per gallon at works
Motor ,, . . .	1 5	,,	1 5½	,, ,, ,,
90% ,, . . .	1 5½	,,	1 6	,, ,, ,,
Pure ,, . . .	1 8½	,,	1 9	,, ,, ,,

Contracts Advertised To-Day.

Coal.

Barrow-in-Furness Gas and Water Department. [p. 268.]

Clacton Gas Department. [p. 268.]

Mantles.

Stoke-on-Trent Gas Department. [p. 268.]

Pipes, &c.

Stoke-on-Trent Gas Department. [p. 268.]

Stores.

Stoke-on-Trent Gas Department. [p. 268.]

New Capital Issues.

East Hull Gas Company.—The tenders for the £60,000 of 4½% preference stock, which were offered on behalf of the Directors of this Company, were opened on Jan. 25. Tenders were sent in for a total of £167,875 at prices ranging from £112 down to the minimum of £103 per £100. The lowest accepted tender was at £106 2s. 6d. per £100 and the average price obtained £106 16s. 6d.%.

Trade Notes.

Gas-Heated Air-Warming Units.

Messrs. Blackman Export Company, Ltd., of 374, Euston Road, N.W. 1, have issued a leaflet describing and illustrating their gas-heated air-warming units, which are designed for steady circulation of warm air, promoting health, comfort, and efficiency. The unit comprises a Blackman electric fan with starter, a gas-heated air warmer, and a set of louvres which deflect the warmed air in the desired direction.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf.-Yr. % p.a.	Dividends. Last Hf.-Yr. % p.a.	NAME.	Quotations. Jan. 27. (Provincial Exchanges Jan. 26.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Oct. 9	7	7	Alliance & Dublin Ord. ...	122—132	...	131½—131¾
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. ...	90—100	...	...
557,655	,,	Aug. 28	7	7	Barnet Ord. 7 p.c.	167—172	...	...
300,000	1	Oct. 23	1/9½	1/4½	Bombay, Ltd.	26/—28/-	...	...
178,280	Stk.	Aug. 14	9½	9½	Bournemouth sliding scale	195—2 5	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	163—168	...	168
439,160	,,	,,	6	6	Do. 6 p.c. Pref ...	138—143	...	141½—142½
50,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
357,900	,,	Aug. 28	7½	7½	Brighton, &c., 6 p.c. Con. ...	163—168	...	...
540,000	,,	,,	6¾	6¾	Do. 5 p.c. Con. ...	150—155	...	158
195,500	,,	,,	6	6	Do. 6 p.c. B. Pref.	136—141	...	137½
1,487,500	,,	July 24	5	5	Bristol 5 p.c. max.	116—117*a*	+1½	...
120,420	,,	Dec. 18	4	4	Do. 1st 4 p.c. Deb. ...	100—102*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	100—102*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	119—121*a*	...	...
855,000	,,	Sept. 25	8	7	British Ord.	155—160	...	157—160
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	151—156	...	155
350,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	106—111	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ..	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...	...
160,000	,,	Jan. 8	5	5	Cambridge 5 p.c. Deb. ...	113—118	...	...
100,000	10	May 22	6	4	Cape Town, Ltd.	5½—6½	...	5½
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7¾	...	...
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb. ...	95—100	...	...
626,860	,,	July 24	6	6	Cardiff Con. Ord.	123—128	...	127
237,860	,,	Jan. 8	5	5	Do. 5 p.c. Red. Deb.	103—108	...	...
157,150	,,	Aug. 14	6½	5	Chester 5 p.c. Ord.	115—12*f b*	...	...
98,936	1	Oct. 9	2/-	2/-	Colombo, Ltd. Ord.	1⅞—1⅞	...	...
24,500	1	,,	1/4¾	1/4¾	Do. 7 p.c. Pref. ...	19/—21/-	...	...
609,204	1	Oct. 9	/11'48	/11 48	Colonial Gas Assn. Ltd. Ord.	1⅛—1⅛	...	20/—20/7½
296,053	1	,,	1/3'30	1/3'30	Do. 8 p.c. Pref.	23/—25/-	...	24/10½
1,775,005	Stk.	July 24	6½	5	Commercial Ord.	122—127	...	124—126
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. ...	74—79	...	...
286,344	,,	Mar. 6	—	5	Do. 5 p.c. Deb. ...	121—126	...	125¾
807,560	,,	Aug. 14	7	7	Croydon sliding scale ...	150—155	...	153—155
469,590	,,	,,	5	5	Do. max. div.	105—110	...	...
500,000	,,	Jan. 8	5	5	Do. 5 p.c. Deb.... ...	120—125	...	121½
542,270	,,	Mar. 6	7	10	Derby Con.	170—180*c*	...	...
55,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	98—100*c*	...	...
209,000	,,	Aug. 28	5	5	East Hull Ord. 5 p.c. ...	108—113	...	...
179,500	,,	Aug. 28	6	6	East Surrey Ord. 5 p.c. ...	128—133	...	...
155,019	,,	Dec. 18	5	5	Do. 5 p.c. Deb. ...	115—120	...	121½
1,002,180	,,	Sept 25	17	15	European, Ltd.	130—135	...	130—134
19,342,763	,,	Aug. 14	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	26/6—27/6*f*	—/3	26/9—27/1½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. ...	87—90	...	88½—90
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	103—106	...	105—106
6,102,497	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb. ...	82—85	...	83—84½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	114—117	...	116⅝—116⅝
3,590,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb.	113—116	...	114½ 115½
270,466	,,	Aug. 28	6	6	Harrogate New Cons. ...	120—125	...	...
82,500	,,	Aug. 28	7	7	Hastings & St. L. 5 p.c. Conv.	149—154	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv	117—122	...	...
140,000	1	Oct. 9	110	1/7½	Hongkong & China, Ltd. ...	29/— 32/-	...	29/3—30/-
218,200	Stk.	Aug. 14	6	6	Hornsey Con. 3½ p.c. ...	130—135	...	131
5,600,000	,,	Nov. 6	14	10	Imperial Continental Cap.	210—220	—5½	212½—218½
223,130	,,	Aug. 14	3½	3½	Do. 3½ p.c. Red. Deb.	90—95	...	...
235,242	,,	Aug. 14	8½	8½	Lea Bridge 5 p.c. Ord. ...	170—175	...	...
2,145,907	,,	Aug. 14	6	6	Liverpool 5 p.c. Ord. ...	130—132*b*	...	...
245,500	,,	Dec. 18	5	5	Do 5 p.c. Red. Pref. ...	101—111*b*	...	...
306,083	,,	July 17	4	4	Do. 4 p.c. Deb. ...	99½—101½*b*	...	...
165,736	,,	Aug. 28	10	8	Maidstone 5 p.c. Cap. ...	180—190	...	...
56,176	,,	Jan. 8	3	3	Do. 3 p.c. Deb. ...	72—77	+2	...
75,000	5	Dec. 4	†10	†10	Malta & Mediterranean ...	9—11	...	...
329,000	—	Oct. 2	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98—103	...	...
231,978	Stk.	Aug. 28	5	5	M. S. Utility "C." Cons. ...	111—116	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	95—100	...	...
112,126	,,	Jan. 8	4	4	Do. 4 p.c. Deb. ...	100—105	...	103½
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
675,000	,,	21 May '81	16	6	Montevideo, Ltd.	60—70	+5	54—64½
2,061,315	,,	Aug. 14	5⅔	5	Newcastle & Gateshead Con.	26/—27/-*d*	+/3	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	101—103*d*	...	...
776,706	,,	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	90⅝—91⅞*f*	...	...
277,285	,,	Nov. 6	5	5	Do. 5 p.c. Deb. '43 ...	105—107*d*	...	...
274,000	,,	Aug. 14	5	5	Newport (Mon.) 5 p.c. max.	101—104*a*	...	...
204,940	,,	Aug. 28	7½	7½	North Middlesex 6 p.c. Con.	153—158	...	...
396,160	,,	Aug. 14	5	5	Northampton 5 p.c. max. ...	101—106	...	...
360,000	,,	Dec. 4	7	†9	Oriental, Ltd.	147—152	...	...
316,617	,,	Dec. 18	8	8	Plym'th & Stonehouse 5 p.c.	165—170	...	...
504,416	,,	Aug. 28	8	8	Portsm'th Con. Stk. 4 p.c. Std	165—170	...	169
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	102—107	...	...
114,000	,,	Aug. 14	5	5	Preston 5 p.c. Pref.	105—110	...	...
686,312	,,	Jan. 22	4	4	Primitiva 4 p.c. Rd. Db. 1911	87—92*	—1	...
389,813	,,	Dec. 18	4	4	Do. 4 p.c. Cons. Deb.	98—93	...	...
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref. ...	6¾—7¼	...	6¾—7
1,736,968	Stk.	Sept. 11	6	6	Sheffield Cons.	134—136*	...	...
95,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	90—94*e*	...	...
133,201	,,	Sept. 11	5	8½	Shrewsbury 5 p.c. Ord. ...	137—142	...	...
90,000	10	June 12	15	14	South African	3—5	...	...
6,709,895	Stk.	Aug. 14	7	5	South Met. Ord.	135—138	...	135½—137½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	137—142	...	...
850,000	,,	,,	20/-*g*	4	Do. 4 p.c. Irred. Pf.	102—105	...	...
1,895,445	,,	Jan. 8	8	3	Do. 3 p.c. Deb ...	80—83	+1	81½—82½
1 000,000	,,	Jan. 22	5	5	Do. 5 p.c. Red. Deb.	111—115*	—1	115
209,820	,,	Aug. 14	8½	8½	South Shields Con.	170—171*d*	...	...
1,543,795	,,	Aug. 14	6	6	South Suburban Ord. 5 p.c.	131—136	...	132½—135
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	114—119	...	...
300,000	,,	,,	—	4	Do. 4 p.c. Pref.	100—103	...	...
868,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	120—125	...	124
100,000	,,	,,	4	4	Do. 4 p.c. Deb.	100—103	...	...
647,740	,,	Aug. 28	5	5	Southampt'n Ord. 5 p.c. max.	110—115	...	112
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	97—102	...	...
350,000	,,	Aug. 28	5½	5½	Swansea 5½ p.c. Red. Pref.	107—111	...	...
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	103—108	...	...
1,076,490	,,	Aug. 14	6¾	6¾	Tottenham and District Ord.	150—155	...	...
300,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	126—130	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	112—117	...	...
199,005	,,	Dec. 18	4	4	Do. 4 p.c. Deb. ...	97—102	...	...
85,701	,,	Oct. 9	6	6	Tuscan, Ltd. 6 p.c. Red. Db.	90—100	...	...
347,769	,,	Aug. 28	7	7	Uxbridge, &c., 5 p.c. ...	146—151	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	112—117	...	116—117
1,322,220	,,	July 10	7	7	Wandsworth Consolidated	155—160	+1	157½—160
1,096,378	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	122½
1,317,964	,,	Dec 18	5	5	Do. 5 p.c. Deb.	120—125	+2	121½—124
158,400	,,	Aug. 28	6A	5	Winchester W. & G. 5 p.c. Con.	115—120	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g.*—For quarter. *h.*—Paid £3, including 10s. on account of back dividends. *i.*—The interest due 1/7/33 was paid on that date. * Ex. div. † Paid free of income-tax. ‡ For year. Hongkong & China, Ltd.—paid on £10 shares.

STOCK FOR SALE BY TENDER.

By Order of the Directors.

KNOTTINGLEY GAS COMPANY.

Messrs. A. & W. RICHARDS

are Instructed to OFFER FOR SALE BY TENDER

6000 £1

FIVE PER CENT. PREFERENCE SHARES.

Minimum Price of Issue, £1 per Share.

Prospectus and Form of Tender (which latter must be sent in by 11 o'clock on Tuesday, 6th February) may be obtained of A. & W. RICHARDS, 37, WALBROOK, E.C. 4.

COMPANY NOTICES.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given that the ANNUAL ORDINARY MEETING of the Proprietors of this Company will be held at the Hotel Metropole, Northumberland Avenue, W.C. 2 (Whitehall Place entrance), on Friday, the 9th day of February, 1934, at Twelve o'clock noon precisely, for the following purposes:

To receive the Report of the Directors and Statement of Accounts for the Year ended 31st December last.

To declare Dividends for the Half-Year ended the same date.

To elect two Directors and one Auditor in the place of those retiring by rotation.

For general purposes.

Dated this 22nd day of January, 1934.

By order of the Board,
T. BROWN,
Secretary.

THE BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company relating to ORDINARY STOCK and PREFERENCE STOCK WILL BE CLOSED on the 13th February, 1934, and RE-OPENED on 27th February, 1934.

By order of the Board,
E. D. DAVEY,
Secretary.

Offices:
139, Cannon Street,
London, E.C. 4.
Jan. 31, 1934.

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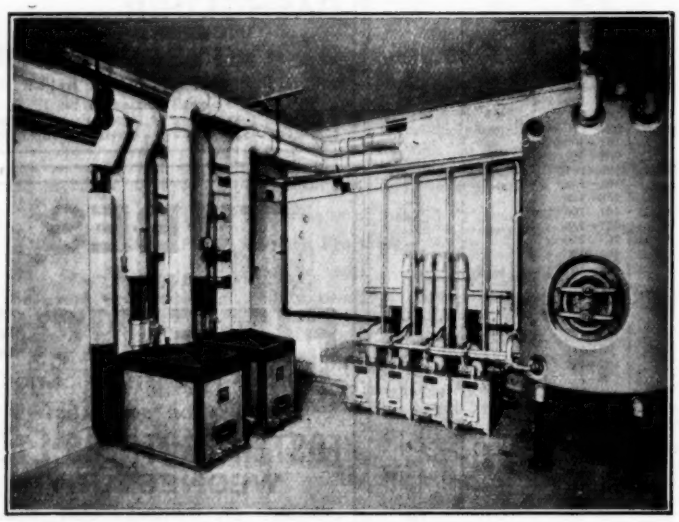

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